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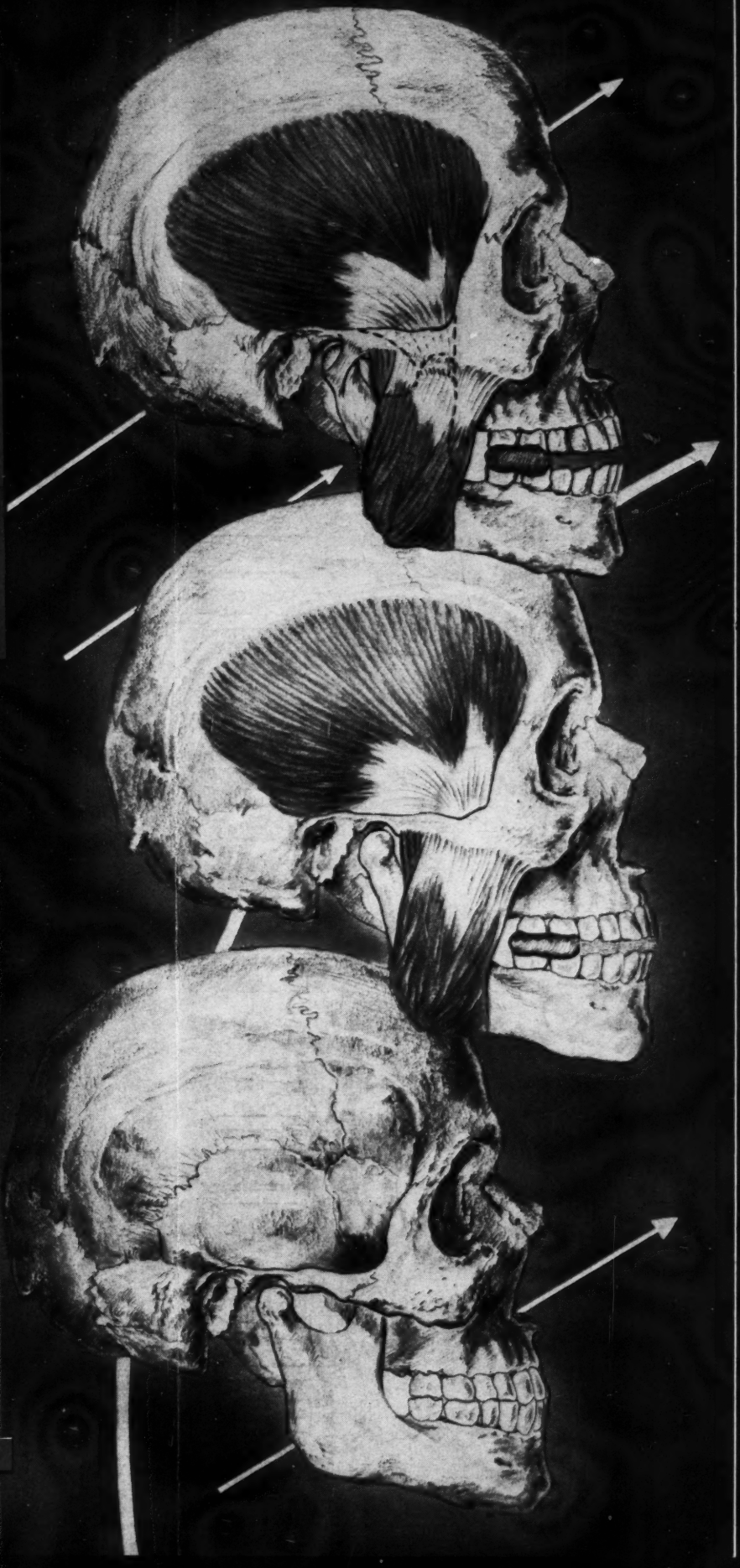

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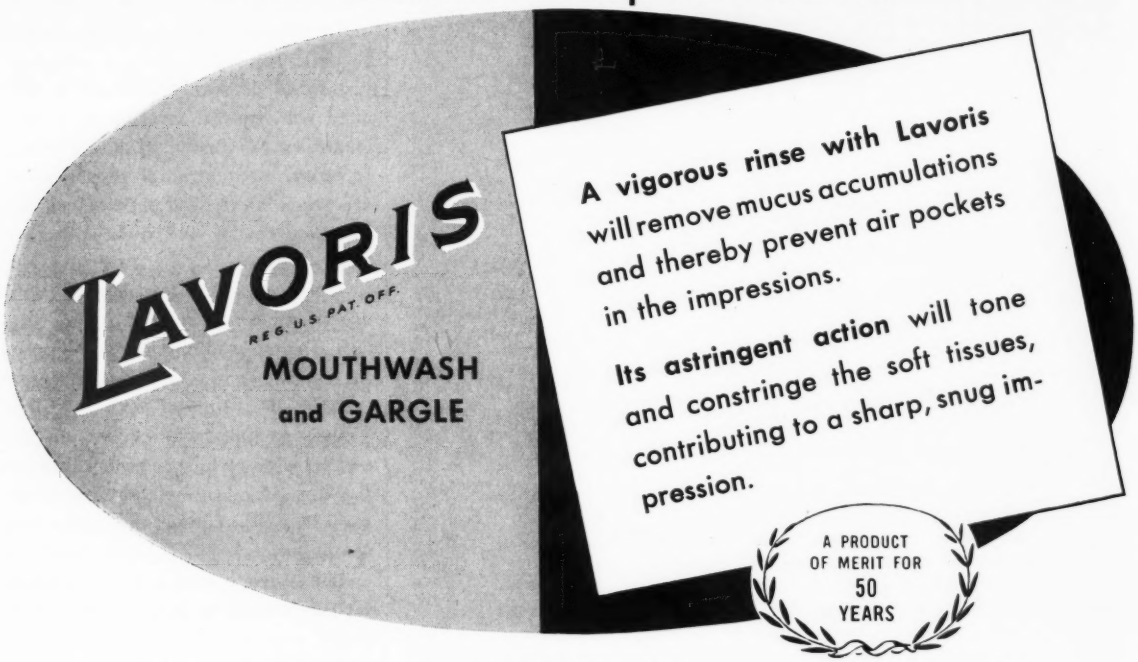
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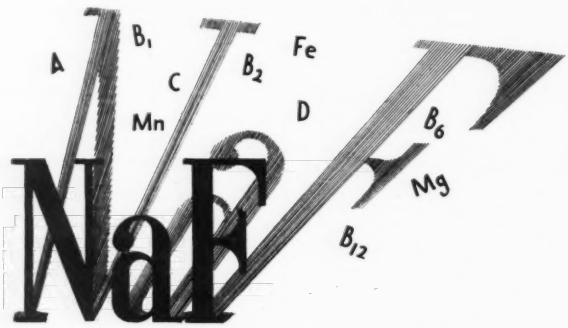

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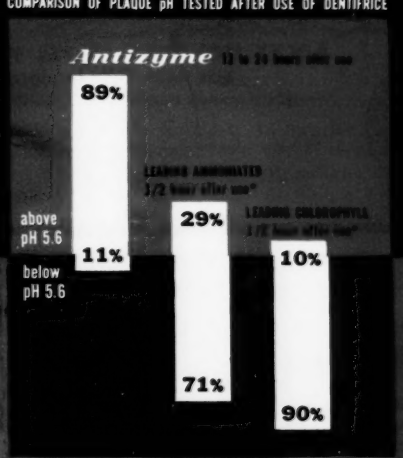

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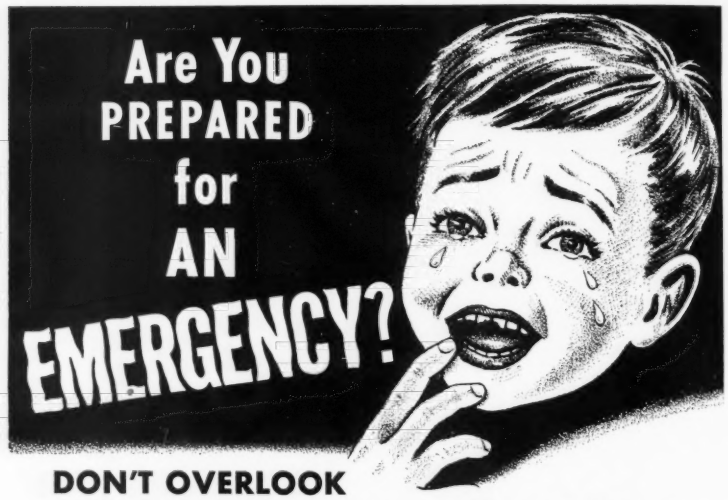

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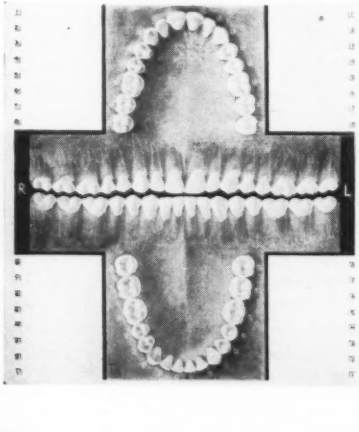

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MELVIN E. PAGE, D.D.S. (University of Michigan, College of Dentistry, 1919), founder of the American Society of Anthropometric Medicine and Nutrition, and Director of the Page Foundation, a nonprofit organization devoted to research in body chemistry, and his collaborator, D. L. BROOKS, A.B. (Wheaton College, Norton, Massachusetts, 1931), present the sixth installment of their continued article, BODY CHEMISTRY IN HEALTH AND DISEASE.

MAURICE H. DANKOFF, B.A. (University of Rochester, 1938), D.D.S. (Western Reserve University, School of Dentistry, 1942) is engaged in the practice of general dentistry and oral surgery. Doctor Dankoff served a year's internship in anesthesia and oral surgery at Mt. Sinai Hospital, Cleveland. MAXWELL WEINGARTEN, M.D. (University of Toronto, 1945), L.M.C.C. (Medical Council of Canada, 1945) is a Diplomate of the American Board of Anesthesiologists, is certified by the Royal College of Physicians and Surgeons of Canada, and is a member of the FACA. Doctor Weingarten is at present Chief of the Department of Anesthesiology in St. Mary's Hospital, Rochester, New York. Doctor Dankoff and Doctor Weingarten present TRICHLOROETHYLENE ANESTHESIA IN ONE THOUSAND DENTAL CASES.

ALEXANDER WEINBERGER, D.D.S. (Temple University School of Dentistry, 1935) emphasizes diagnosis and treatment planning in his practice. Doctor Weinberger is a member of the American Academy of Applied Nutrition, and the American Academy of Oral Roentgenology. His article, PAGET'S BONE DISEASE, is his third to appear in DIGEST.

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EDWARD J. RYAN, B.S., D.D.S., Editor

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Temporomandibular JOINT PHYSIOLOGY *and* JAW SYNERGY

HARRY L. PAGE, Valparaiso, Indiana

DIGEST

The importance of a thorough knowledge of physiology and synergy articulation cannot be overestimated. This article proposes arriving at an understanding of jaw physiology and function by deductive reasoning. Biomechanical concordance between known physiology and known physical principles is demonstrated and it is implied that concepts which are admittedly producing failure and mouth destruction be abandoned in favor of the tested principles presented herein.

Condylar Paths in Articulation

Next to centric relation the condyle paths seem to have attracted the most attention and to be considered of the greatest importance by teachers of articulation. The various accepted methods of determining the condyle paths are well known so it is unnecessary to repeat their theories here. The essence, however, of all the conventional techniques is that *some* method of recording and using condyle paths is necessary if accurate articulation is to be secured. From this it may be assumed that the importance of using condyle paths in articulation is agreed upon by dentistry's formal teachers.

Opposing Point of View—There are now at least three different ways, however, to show that the movements of the condyles along their paths (1) not only have no significance in determining proper articulation, but (2) are actually detrimental to articulation. This applies both to natural and artificial teeth and will prevail regardless of the method used to record or apply condylar movements.

Value of Condyle Paths Rarely Analyzed—Like centric relation, the condyle paths seem to have been immune from analysis. Like centric relation, too, their lack of value when examined is impressive.

Condyle Paths Ignored in Practice—It is not inferred that the value of the condyle paths has not been previously doubted. The fact that the majority of dentists disregard them would indicate that their value is questionable. Finding the results no better and the added effort unjustified, the practical operator ignores them.

Fixed Hinge Articulators in General Use—If an adaptable instrument is used, the condyle slots are locked more often than not. This is true despite the fact that dental students are almost universally trained in the use of adaptable articulators and are required to purchase a new one before graduation.

Experiments Undertaken—It is contended here that almost no sound reasoning has been expended to clarify the situation although many haphazard experiments have been conducted. For example, Craddock[1] described the results of ". . . 54 consecutive wax records of jaw relations and 240 articulator adjustments of condyle path inclinations made according to them."

Conclusion from Experiments: Craddock concluded that ". . . dentists who have never made . . . condyle path adjustments have not denied their patients any essential service; practitioners who . . . employ such records and are blessed with the necessary mental flexibility . . . may abandon their use with a wry smile; those to whom the conclusions of this study seem blasphemous . . . may continue . . . secure in the knowledge that they are causing . . . no harm."

Lack of Unity Determined: From Craddock's text it is difficult to know how he justified these "conclusions," especially the last. He reported emphatically that he could not obtain two wax mouth records that were alike even on the same patient. But he determined this lack of unity by testing these records in an articulator from which he admitted being unable to transfer a wax record mounting to a second supposedly identical instrument and secure a duplicate result.

Reason of Absence of Unity: Craddock attributed this to ". . . errors produced . . . by differences in the flexibility . . . friction, clearance and wear." He also stated ". . . variations will be found . . . when the adjustment is attempted on different occasions with the same records."

No Correlation Between Roentgenographic and Clinical Determination: The mechanical phase of Craddock's experiments was checked by cephalometric roentgenograms with the condyles in different positions on the fossal slope to determine the assumed condyle path inclination and it was declared that ". . . no correlation exists between roentgenographic and clinical determination of condyle path inclination . . ."

Note of Warning: At the same time Craddock warned: "As for the roent-

[1]Craddock, F. W.: The Accuracy and Practical Value of Records of Condyle Path Inclination, JADA **38**:697 (June) 1949.

gen findings, these must be interpreted with caution since it is not the purpose of this investigation to establish the reliability of the roentgenographic methods per se." How can authentic conclusions be drawn from such careless methods?

Unreliability of Roentgenograms Conceded: A battery of admittedly inaccurate articulators was used to determine the value of the patient's mouth records. While the notorious tendency of wax to warp was not mentioned, this could easily have accentuated the variations accounted for by inaccurate instruments on different occasions when the same wax records were used. The unreliability of roentgenograms was freely conceded.

Cranial Plane not Established: From the text and from photographs of the instrument mountings, no cranial plane was established in the head for transfer to the articulator. Without some cranial plane acting as a common side for the head and for the instrument-mounting angle, there could be no possible way to compare the inclination of the condyle path; and no way to determine that there was "no correlation" between the ". . . roentgenographic and clinical . . . path inclination." Any conclusion must of necessity have been guesswork.

Abstract Approach Suggested: Such experiments indicate the unreliability of the equipment and methods used in general in attempting to capture and utilize the patient's jaw movements. Failure of equipment and methods, however, does not disprove theories. It would be gratifying to be able to endorse the results of these empirical procedures; the execution, however, is too illogical to merit consideration. The problem can be approached more constructively through abstract reasoning.

Nonworking Condyle Operates as Universal Joint

The condyle paths have always been regarded as though they were inflexible grooves that gripped the condyles and forced them and the jaw to move exclusively in translational motion. The significance of the fact that the condyle path recording is a product of the *nonworking condyle* has been disregarded. The fact, even more significant, that the nonworking condyle not only does not, but also cannot, engage in pure translational motion has also been ignored. The nonworking condyle can, does, and must rotate freely in all planes as it glides simultaneously in all planes along the fossal slope. This means that the nonworking condyle, the generator of the condyle path, operates as a perfect universal joint.

Minor Role of Subordinate Mechanism—A universal joint (even one that does not translate and rotate in all planes simultaneously) *has no power to govern any force or movement.* Its sole value lies in its unique capacity to protect one mechanism against misalined torque no matter how sudden or erratic, and by swivel action redirect it to a second mechanism. It does this by adapting and subordinating itself instantly and completely to every torquing force received. This indicates that the nonworking condyle is merely a pawn of other mechanisms that originate and control jaw function. Being a puppet mechanism, the part played by the nonworking condyle must be minor. An illustrative example may be useful.

Description of Method—One of the most meticulous articulating methods in existence is the one used by the Gnathological Society of California in which radial laterals are used to determine the assumed functional synergy of the jaw. As these radials are being made by the patient they are captured as pantographic tracings upon glass plates. These tracings are then etched into the glass as permanent records.

Results Claimed — Gnathology claims to have demonstrated that the condyle paths so pantographed during pure radial laterals are identical with the condyle paths pantographed by the same patient when opening wide with no lateral involved. The demonstration is cited primarily by the gnathologists to support their contention that the hinge-axis is constant to the mandible. While that is a subject foreign to this discussion, its validity, too, is challenged by the following conclusion.

Theory of Minor Role Confirmed—If the nonworking condyle delivers the same pantograph for all types of jaw movement, the logical conclusion would seem to be that it represents none of them. Thus the nonworking condyle does operate as a puppet mechanism, one that has already been classified as a universal joint. This tends to confirm the theory that the value of the path that the condyle records is minor.

Bennet Movement in Condyle Path—According to all orthodox articulation concepts, including gnathology, the Bennet movement is part of the condyle path. These concepts also insist that the Bennet movement occurs in lateral motion only. This presents an untenable situation: If the condyle paths for pure lateral and pure opening were identical yet the Bennet were a component of lateral only, either the two paths must not be identical or the Bennet movement must be common to both.

Two Bennet Movements—Actually, none of these concepts appears to be correct. Logically, there are two distinct Bennet movements, one for vertical and one for lateral:

(1) The first is caused by the asymmetry of the hinge-axes.

(2) The second is caused by the fact that the axis around which lateral movement rotates is not perpendicular to the plane of lateral jaw travel.

The second seems clear from the fact that the condyle does not bear in the trough of the fossa but against the anterior fossal slope. In both cases a bodily shift or twist of the mandible must result.

Utilization of Composite Bennet Movement—When the rotary-closing movement is combined with a medial jaw motion to produce the natural chewing stroke, a composite Bennet should occur. To utilize this composite Bennet, it is necessary to combine the patient's chewing angle in the transverse plane with his closure arc while the latter is under the kinematic control of a hinge-axis. This has been done successfully in the articulation method known as Transographic.

The Fischer Angle—That the condyle path in pure lateral must also differ from the path made by simple opening or closure will be obvious from the varying contours of the fossa. Normally, the path followed during lateral motion should be steeper than the path followed during simple opening and closing. The difference between the two is known as the Fischer angle.

Reason for Erroneous Assumption—According to Bergstrom,[2] Fischer gives the difference between the two paths as about 5 degrees. If the angle is that small, it could account for the erroneous assumption of the gnathologists; the eyes are not reliable where such extremely small variations are involved.

Working Condyle Also a Universal Joint

In concentrating upon condyle paths and the lateral movements of the nonworking condyle, orthodox concepts seem to have overlooked the importance of the working condyle which is also a universal joint for it absorbs three dimensional rotational and translational movements although to a lesser extent than the nonworking condyle.

Fulcrum for Jaw Power—The important difference between the working and the nonworking condyle is that the working condyle is the fulcrum for jaw power, a commodity that the mandible, being a lever, must have.

Movements of Working Condyle—During the preliminary masticating stroke the jaw fulcrum lies in the mandibular angle. Before the final part of the power stroke takes place, however, the working condyle has reached and is braced against its ultimate and fixed pivotal spot on the anterior slope of the mandibular fossa.

Anchored by Oppositional Forces—The working condyle is anchored by the pull of the posterior and horizontal fibers of the temporal and the vertical pull of the internal masseter segment, both operating in opposition to the resistance of the temporomandibular ligament (Fig. 1).

Force of Interdenting Phase Released—The external masseter segment and its teammate, the internal pterygoid, reinforced by the anterior and vertical fibers of the temporal, operating in conjunction with a hinge-axis, release the full force of the interdenting phase of cutting and triturating the resistant bolus. From this point to the finish of the masticating stroke, the only translational movement of the working condyle is the Bennet.

Nonworking Condyle Idle—During the process described, the nonworking condyle has been idling along in combined translational and rotary motion under the control of directives coming from the muscles and the fulcrum of the working condyle. This continues up to the instant that it, too, attains its final bearing point on the anterior slope of the mandibular fossa. But at this point the synergy is completed; throughout the entire movement, therefore, there has been nothing for the nonworking condyle to do.

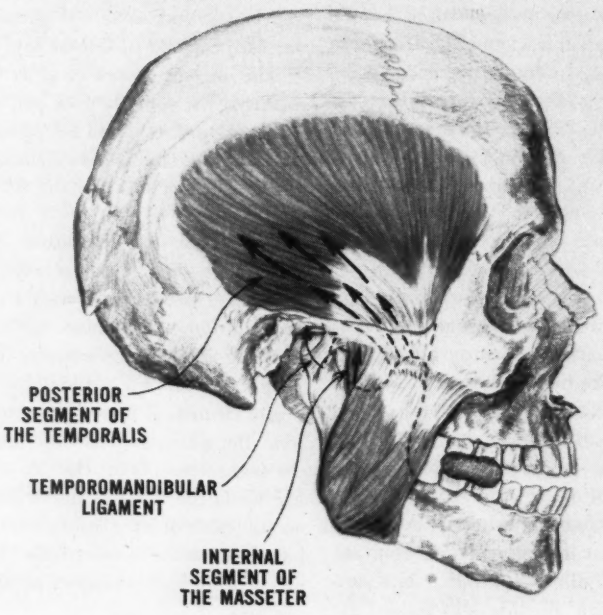
Movements in Unison—There is, of course, the situation where both condyles are in their ultimate fulcral and hinge-axis positions as the patient closes in power mastication. Both become working condyles operating in unison just as the single condyle does when functioning in the more typical chewing stroke. In neither case does the condyle path have any real significance; the finale arrives with one or both condyles rotating in fixed positions. Translational motion, the motion that scribes and follows the condyle path, is over.

Position of Condyles—When in their so-called "centric relation" the condyles are not braced against the "back of the glenoid fossae;" nor do they rest in the "troughs of the glenoid fossae."

Braced Against Anterior Slopes of Mandibular Fossae—Actually, "glenoid" designates a type, not a specific fossa; the best example being in the scapula. Contrary to the popular misconceptions, the condyles are braced against the anterior slopes of the mandibular fossae. The reasons should be clear from a study of the anatomy

[2]Bergstrom, Gunnar: Reproduction of Dental Articulation, a Kinematic Investigation, Acta Odontologica Scandinavia **9**:13 (Jan.) 1959.

WORKING CONDYLE ANCHORED IN HINGE POSITION DURING FINAL POWER CLOSURE



and physiology of the temporomandibular joint and the jaw musculature.

Muscular Forces in Mastication

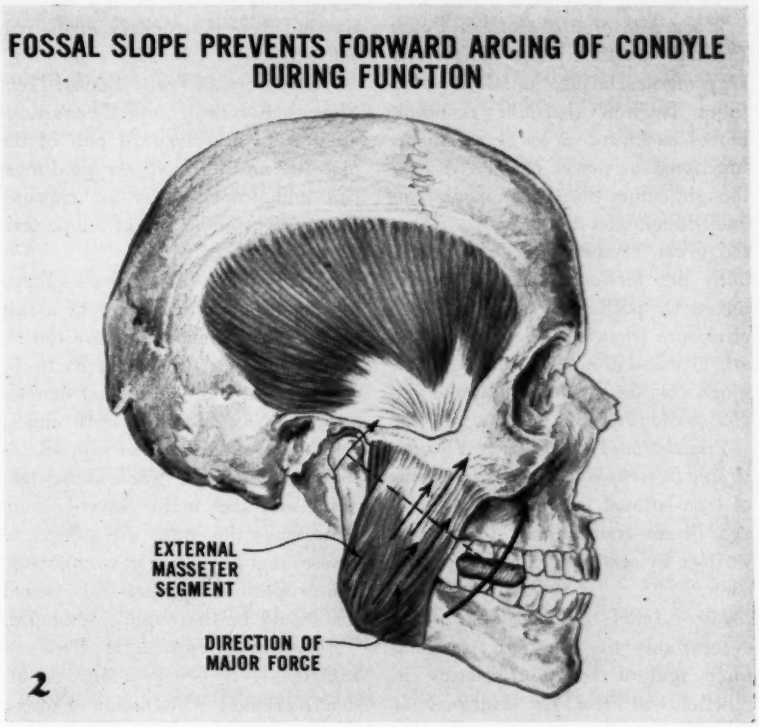
The primary force exerted by the power muscles of mastication tends to close the jaws. Complementing this force is one tending to move the mandible somewhat forward bodily. The origin, insertion, and character of the musculature are indicative of this. For explanatory purposes certain muscles must be eliminated from the discussion.

Muscles Neutral in Power Closure—Both the temporal and the masseter have segments that exert force vertically. Consequently these segments have no power to originate or to oppose either forward or backward movement. They are neutral. The temporal also possesses a segment that exerts force posteriorly but this segment is attached to the coronoid process.

Subsidiary Implementation — Just as the reins running from a driver's hands to the bit in a horse's mouth tend to pull the animal's head up and back, so the posterior temporal fibers do the same to the condyles. They are not integral with the muscular forces that apply strictly to power closure. This directs attention to the external masseter segments and the internal pterygoids.

Location of Masseter Muscles—The external masseter segments and the internal pterygoids parallel each other; one on the outside and one on the inside of the jaw. It will therefore be necessary to consider the masseters only. They originate in the center and anterior of the zygomatic arch, well forward of their insertion (Fig. 2), and slant back and down when regarded in the sagittal plane, to cradle the lateral sides and the perimeter of the mandibular angle.

Forward Movement Checked—The masseter and internal pterygoid muscles would draw the entire jaw forward were it not for the fulcral bearing of the condyles upon the anterior slopes of the mandibular fossae. The fact that the fossal slopes against which the condyles are braced face backward (Fig. 2), as well as downward, blocks this forward movement tendency and changes it to rotary movement. It also balks another force that would arc the condyles forward.


FOSSAL SLOPE PREVENTS FORWARD ARCING OF CONDYLE DURING FUNCTION
EXTERNAL MASSETER SEGMENT
DIRECTION OF MAJOR FORCE
2

Tendency to Forward Arc—The power application field of the masseters and the internal pterygoids lies between the condyle and the bolus of food. The food, therefore, especially if it be tough, acts as a fulcrum (Fig. 2). That being the case, the pull of these power muscles tends to arc the condyles and ramus upward and *forward* (not backward as is sometimes stated) around the bolus as a fulcral center.

Opposition to Forward Arc—Again, the fact that the fossal slope has a bearing surface opposed to the tendency of the condyle to arc forward becomes important.

Result of Resection of Condyles—It is clear that disaster would follow if the condyles were braced (1) against the backs of the fossae, (2) against "stops" that limit retrusion only, or (3) were in the troughs of the fossae. The condyles would be rotated forward and away from their necessary fulcra with every power stroke. The jaw would have little stability or efficiency. McCollum[3] reported after reviewing a case where both condyles had been resected and thus deprived of fossal bearing that ". . . the ramus was being pulled upward over a fulcrum in the region of the second molar, so that the anterior teeth became separated more than a quarter of an inch."

Graphic Presentation—Smith and Robinson[4] presented the same situation pictorially describing the result as a ". . . posterior displacement of the mandible with open bite."

Result Achieved by Opposing Patterns—McCollom's description would appear to be more accurate: as the unopposed condyle is rotated upward and forward by the masseter and internal pterygoid, the mandible body must swing along an arc running backward and upward at the posterior and backward and downward at the anterior. While the anterior teeth show an "open bite," the posterior

[3]McCollum, B. B.: Fundamentals Involved in Prescribing Restorative Dental Remedies (Reprint), Dent. Items of Interest **61**:522-535 (June) 1939, (Feb.) 1940.

teeth actually present a closed bite.

Movement of Mandible in Power Closure—Another phase of jaw synergy merits clarification. It is sometimes believed that the mandible moves backward as an entity during functional or power closure. A little thought denies this. The upper ramus and the condyles do *arc backward* but the lower ramus and the mandible body *arc forward*. This is because during the preliminary stages of power closure (that is, while the condyles are in translational motion) the jaw hinge-axes lie in the mandibular angles of the jaw.

Translational Movements Demonstrated by Graph—Gysi's early graphs of translational jaw movements long ago demonstrated this.[5] It may be verified by watching another person chew.

Force Against Fulcrum in Function—Inevitably the question regarding force against the joint fulcrum in function will arise. The skull bone at the point of power contact by the condyle is known to be exceedingly thin and covered by a type of avascular tissue considered nonstress-bearing. So is the intervening meniscus. This has led Robinson[6] and possibly others, to advance a theory that mandibular action is a reflex rather than a lever type.

Former Discussion Inadequate—In a previous article[7] the question of condyle-fossal load was discussed briefly. It was stated that the temporomandibular ligament assumed most of the load making a massive fossal bone unnecessary. In the light of Robinson's explanation this now seems inadequate.

Supplement to Theory Feasible—Robinson's theory is well founded, logically developed, and convincingly stated. It is satisfying to find coherent and logical reasoning backed by real knowledge of and attention to physical and physiologic investigation and data. Robinson makes it possible to supplement without in any way detracting from the cogency of his reasoning.

Heavy Vertical Force Against Teeth Shown—Robinson correctly envisions an upward and forward pull of the masseter and internal pterygoid muscles complemented by an approximately right angle pull of the posterior temporal segment.

Schematic Representation — Erecting a parallelogram of forces alongside a skull, Robinson shows the resultant of these various pulls to be operating in a direction that denotes heavy force against the teeth almost vertically which tends to support his contention that the dental arches and teeth are the main stress-bearing areas while the joints are subject to stresses that are minor in comparison. The proposition appears to be sound but should be thoroughly developed.

Resultant in Masticating Areas not Sufficient — It seems more profitable to extend the discussion of forces generated by the masseter and internal pterygoid and the posterior temporal segments. These produce a resultant in the masticating area only. There remain the anterior temporal and the internal masseter segments to consider. This combination has a definite bearing upon the forces exerted directly in the condylar-fossa area.

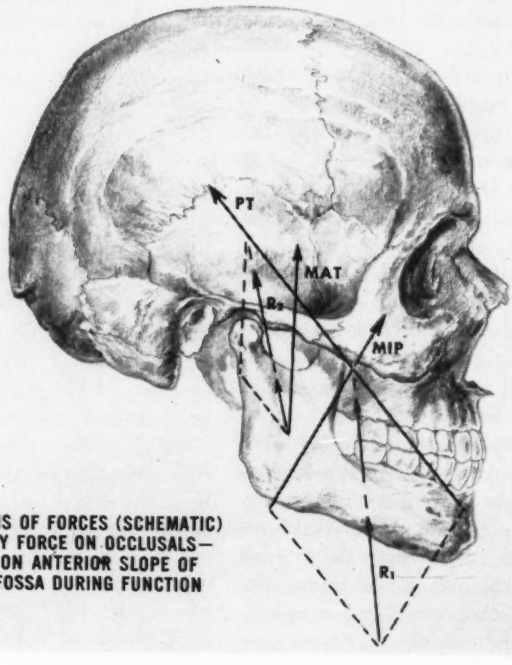
Additional Vertical Forces—Both the anterior temporal and the internal masseter segments exert force vertically. They operate in separate planes but on parallel lines less than the width of the sigmoid notch from each other. It seems justifiable to consider them as combining into one force operating along a line that nearly bisects the notch vertically. Such a force would tend to elevate the condyle and force it heavily again the fossal slope.

Modifying Force — The posterior temporal segment, however, has a modifying part to play in the actions of these two muscular segments, too.

Pattern of Forces Shown in Figure Three

Following Robinson's plan of erecting a parallelogram of forces beside a skull, one force in Figure 3 is represented by MAT (the anterior temporal and internal masseter segment combination). The line PT represents the posterior temporal component which was represented by T in Robinson's

MASTICATING FORCES ON TEMPOROMANDIBULAR JOINT



PARALLELOGRAMS OF FORCES (SCHEMATIC) INDICATE HEAVY FORCE ON OCCLUSALS—LIGHT FORCE ON ANTERIOR SLOPE OF MANDIBULAR FOSSA DURING FUNCTION

3

[4]Smith, Arthur E., and Robinson, Marsh: Mandibular Function after Condylectomy, JADA **46**:308 (March) 1953.

[5]Clapp, G. W.: Reprint, J. Pros. Dent. **2**:150, Fig. 4 (March) 1952.

[6]Robinson, Marsh: The Temporomandibular Joint: Theory of Reflex Controlled Nonlever Action of the Mandible, JADA **33**:1260 (Oct. 1) 1946.

[7]Page, Harry L.: The Hinge-Bow, DENTAL DIGEST **58**:536 (Dec.) 1952.

Figure 6.[8] The line R_2 shows the resultant of these two forces in their action on the condyle. Note that the final force approaches parallelity with the fossal slope.

Fossal Bone Under Moderate Stress—Only moderate stress would be directed against the fossal bone no matter how ponderous the force (R_1, the resultant of masseter and internal pterygoid, MIP, combined with the posterior temporal segment, PT) that was operating against the teeth.

Reflexes Implement Relief—Should some contingency cause this force on the fossal bone to exceed safe limits, reflexes, in accordance with Robinson's theory, would relieve the situation by means of the posterior temporal segment.

Temporomandibular Joint Physiology

The posterior temporal segment is attached to the coronoid process. A reflex that increased the pull of this segment would tend to rotate the condyle away from and lighten its bearing against the fossal slope. Logically, the same reflex would proportionately reduce the pull of the internal masseter segment.

Posterior Movement of Condyle Controlled—The temporomandibular ligament stands guard to control the amount of posterior movement of the condyle and, by opposing the pull of the posterior temporal segment, to produce an upward and forward arcing of the condyle that anchors it in its pivotal position against the fossal slope.

Minor Stress on Joint—In serving to produce an upward and forward arcing of the condyle the temporomandibular ligament assumes a substantial share of the residual stress between the condyle and the fossa. It is while in this fixed position that the condyle operates in power closure by revolving upon its hinge-axis, the kinematic control center so vital to successful articulation procedures. In this manner is evolved the unique type of mechanism that operates as a lever by severely modified rather than full force against its fulcrum.

Condyle Paths and Curve of Spee—A popular belief prevails that the condyle paths are responsible for the Curve of Spee. There are numerous references in dental literature to a desired parallelity between the condyle paths and this curve. It is considered the basis of all milling operations in the mouth; in this instance there can be no question but that the condyle path is pictured complacently as an inflexible groove resulting in pure translational motion of the jaw as it closes.

Concept of Inflexible Path Untenable—The jaw can and does rotate to a closed position in any plane from any condylar-fossa position. But there is only one condylar-fossa position where the occlusal curve of the lower teeth agrees with the occlusal curve of the upper teeth. This is also the only condylar-fossa position wherein the teeth can interdentate. This is the hinge position.

Hinge-Axes Prime Determining Factors—The hinge position is defined as "that position of a condyle in its fossa that permits location of a hinge-axis." It is therefore clear that hinge-axes, not condyle paths, are the prime factors in determining the occlusal curve.[9] Once more, the condyle paths appear to have a minor significance in the articulation of teeth.

Purpose of Fossal Slopes

It might be argued that nature provided fossal slopes so that lateral and protrusive movements could be made. But why do laterals and protrusives need fossal *slopes?* They could follow a path equally well if there were no fossal declination.

Destructive Factors in Articulation and Occlusion—(1) It is easy to demonstrate that the fossal declination may be changed radically in an accurate articulator, such as the Transograph, without producing any interference in an articulation already known to be perfect.

(2) It is equally simple to demonstrate that articulation methods based upon laterals will invariably leave posterior teeth completely out of contact.

These two demonstrations make it clear that *lateral movements along the condyle paths not only have no value in articulation but also that they are ruinous both to articulation and occlusion.*

Nature's Plan for Fossal Slopes—It is suggested that the fossal slopes serve two purposes not directly connected with the kinematics of articulation:

(1) They make it possible to engage or disengage the cusps of the posterior teeth along any angle. A cat or a dog, having no external pterygoids to snap the condyles down fossal slopes and thus disengage the posterior teeth toward the right or left, cannot do this. Each animal opens and closes the jaw in one sagittal plane only.

(2) It will be recalled from former discussion that the fossal slopes prevent the condyles from arcing forward and out of their vital hinge-axis positions during power closure.

Summary

Evidence has been presented showing that condyle paths are only of minor importance in the articulation of teeth. The reasons have been given and discussed.

Also the manner has been described in which muscles, ligaments, and joints, as constructed and related, would seem to be required to function if they are to function successfully.

104 *Garfield Avenue.*

[8]Robison, Marsh: The Temporomandibular Joint: Theory of Reflex Controlled Nonlever Action of the Mandible, Figure 6, JADA **33**:1260 (Oct.) 1946.

[9]Page, Harry L.: The Occlusal Curve, DENTAL DIGEST **59**:19 (Jan.) 1952.

Topical Application of Hydrocortisone Acetate in the Treatment of APHTHOUS ULCERS

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DIGEST

The adrenal cortical extracts, cortisone[1] and hydrocortisone,[2] have been used with notable success in the treatment of various arthritic conditions because of the anti-inflammatory effect of these hormones. Among others, Strean,[3] and Strean and Horton[4] have reported the successful use of these agents in dental practice. Because hydrocortisone acetate can be applied topically in the form of an ointment and was used successfully in the treatment of various dermatologic conditions, its effect in the treatment of aphthous ulcers which are superficial and surrounded by an inflammatory zone, was studied. Seventeen case histories in which this agent was used are described.

Details in Treatment

(1) *Age Range of Patients*—The series of treated patients reported consists of seven males and 10 females, the youngest four years old and the oldest 55.

(2) *Type of Lesion Treated*—In virtually all instances the lesions were small, having a yellow depressed center and a bright red hemorrhagic border.

(3) *Method of Application*—For comparison, two concentrations of hydrocortisone, 1 per cent and 2.5 per cent, in a petrolatum base were used. The material was applied topically in the area of the lesion.

(4) *Amount of Material Used*—About ¼ inch of expressed ointment was massaged into the mucous membrane.

Case Reports

Case 1—A female patient, age 18, received an injection of local anesthetic in the left upper bicuspid region. Within two days aphthous ulcers developed at the site of injection. Hydrocortisone ointment (2.5 per cent) was applied topically every two hours. After three days' treatment the patient was completely relieved with no ulcer mark visible.

Case 2—A male patient, age 33, received operative treatment on the upper right third molar which necessitated stretching the tissues for thirty minutes at the junction of the buccal and alveolar mucosa. On the following day ulcers developed in the mucobuccal fold which extended from the right upper third molar to the right upper first bicuspid. The pain was severe. Hydrocortisone ointment (1 per cent) was applied every two hours. At the end of three days the patient was free of all pain and no inflammation was visible.

Case 3—In a female child, age 10, aphthous ulcers were found in the mucobuccal fold of the left lower area. The pain was severe. Hydrocortisone ointment (2.5 per cent) was applied every two hours. The pain subsided after one day's treatment and the ulcers disappeared after three days.

Case 4—A female patient, age 22, complained of the development of aphthous ulcers on the palate near the molar regions on both sides. These lesions developed two months after marriage and recurred with each menstrual cycle thereafter. Hydrocortisone ointment (2.5 per cent) was applied every two hours. Pain and ulcers disappeared after three days' treatment. On observation after two months there was no recurrence.

Case 5—A female patient, age 55, was found to have extensive recurrent aphthous ulcers under a lower partial denture on the alveolar mucosa and on the reflection of the mucous membrane of the floor of the mouth. She wore a full upper denture, but no ulcers were found on the mucosa under this denture. Hydrocortisone ointment (2.5 per cent) was applied every two hours for one week with no observable response to treatment. Three per cent aureomycin and penicillin troches (5000 units) were also tried, but without results.

Case 6—As a result of orthodontic treatment a thirteen-year-old girl developed hypertrophy of the labial gingivae. The patient was a mouth breather. Hydrocortisone dental ointment (2.5 per cent) was prescribed and the patient was instructed to apply the ointment every two hours. One month later no beneficial effects of the treatment were observed. Upon questioning, the patient's mother suggested that the child did not cooperate and perhaps did not apply the ointment as directed.

Case 7—A male child, age 12, had aphthous ulcers in the right lower

Author's Note: Appreciation is expressed to Lyon P. Strean, Ph.D., D.D.S., Medical Division, Merck & Co., Inc., Rahway N.J., for the hydrocortisone ointment used in this clinical trial.

[1]Hench, P. S.; Kendall, E. C.; Slocumb, C. H.; and Polley, H. F.: Effect of a Hormone of the Adrenal Cortex (17-Hydroxy-11 dehydrocorticosterone; compound E) and of Pituitary Adrenocorticotropic Hormone on Arthritis; Preliminary Report, Proc. Staff Meet., Mayo Clinic **24**:181-197, 1949.

[2]Hollander, J. L., et al.: Hydrocortisone and Cortisone Injected into Arthritic Joints: Comparative Effects of and Use of Hydrocortisone as a Local Antiarthritic Agent, JAMA **147**:1629-1635 (Dec. 22) 1951.

[3]Strean, L. P.: Possible Role of Cortisone in Dental Practice, N. Y. Jour. Dent. **22**:102-104 (March) 1952.

[4]Strean, L. P., and Horton, C. P.: Hydrocortsone in Dental Practice, DENTAL DIGEST **59**:8-16 (Jan.) 1953.

lingual reflection of the mucous membrane. Hydrocortisone ointment (1 per cent) was applied every two hours. Within 24 hours all symptoms were cleared. No recurrence of the ulcers was reported after two months.

Case 8—A woman of 45 presented with herpetic lesions of the left lower lip. The lesions were painful, fissured, and crusted. Hydrocortisone ointment (1 per cent) was applied every two hours; relief was reported six hours later. The crusts softened and the fissures closed. There was no recurrence after two months.

Case 9—In a patient, age 35, the gingivae around the upper right first bicuspid was traumatized with a matrix band during operative treatment. On the following day many minute discrete painful vesicles were found in the area of the traumatized tissue which was surrounded with an extensive inflammatory zone. Hydrocortisone ointment (2.5 per cent) was applied every two hours. Within one day pain and inflammation disappeared. There was no recurrence within three months.

Case 10—In a male patient, age 16, aphthous ulcers were present along the lower labial mucobuccal fold. Hydrocortisone ointment (1 per cent) was applied every two hours. Within one day pain and inflammation disappeared. There was no recurrence within three months.

Case 11—A young woman, age 21, had herpetic lesions on the lower left lip. The lesions were painful, fissured, and crusted. Hydrocortisone ointment (1 per cent) was applied every two hours. Within six hours the crusts softened and the fissures closed. There was no recurrence of the lesions.

Case 12—A male child four years of age had aphthous ulcers on the mucous membrane behind the upper central incisors and covering a large section of the rugae. Considerable pain and inflammation were present. Hydrocortisone ointment (2.5 per cent) was applied every two hours. After one day the pain disappeared and there was no evidence of inflammation. No recurrence was reported.

Case 13—A six-year-old girl had aphthous ulcers in the mucobuccal fold of the lower anterior region. The lesions were painful and inflamed. Hydrocortisone ointment (1 per cent) was applied every two hours. Within one day the pain disappeared and the inflammation subsided. There was no recurrence of the ulcers.

Case 14—A four-year-old child, male, had aphthous ulcers in the lower left labial mucobuccal fold. The vesicles were painful and surrounded by an inflammatory area. Hydrocortisone ointment (1 per cent) was prescribed; the patient's mother was instructed to apply the ointment every two hours. Relief was reported.

Case 15—In a male patient, age 28, tiny, discrete aphthae covered the whole palate. Hydrocortisone ointment (1 per cent) was applied every two hours. Complete relief was obtained within three days and there was no recurrence.

Case 16—In a female patient, age 25, a row of tiny vesicles was present in the lower right lingual mucosa from the third molar to the first bicuspid. The area was painful, resembling neuralgia of the mandibular branch of the trigeminal nerve, with pain extending to the ear. Hydrocortisone ointment (2.5 per cent) was applied every two hours. Pain disappeared in one day and vesicles were not found after three days. There was no recurrence of vesicles.

Case 17—A male patient, age 48, had minute, almost imperceptible aphthae, in fissures on the right lateral border of the tongue in the bicuspid area. The tongue on the affected side was painful for about two weeks when a physician prescribed vitamin B complex. There was slight improvement but the condition recurred within a few days. The patient was referred to the author; hydrocortisone ointment (2.5 per cent) was prescribed with instructions to apply the material every two hours. Within one day pain and ulcers disappeared and there was no recurrence of the lesions.

Discussion

In the past treatment for aphthous ulcers has not been notably satisfactory. In the series of treated patients presented in this article the results following the use of hydrocortisone ointment have been highly encouraging:

1. Of seventeen patients 15 responded promptly to treatment with this hormone.
2. In one patient failing to respond to topical therapy it is possible that systemic treatment with hydrocortisone tablets might have had a more favorable effect.
3. In the second failure, lack of cooperation on the part of the patient may have been a contributing factor.
4. It is of interest that even in this brief series the incidence of aphthous ulcers is higher among females.
5. Two concentrations of hydrocortisone acetate were used in this clinical trial, 1 per cent and 2.5 per cent. While there were no failures with the use of the lower concentration, in the more severe cases it is perhaps advisable to use the 2.5 per cent concentration.

Summary and Conclusions

Seventeen patients suffering from aphthous ulcers were treated topically with hydrocortisone ointment, 1 per cent and 2.5 per cent. Fifteen of these patients responded promptly to this therapy, regardless of the concentration of the hormone. Hydrocortisone acetate in an ointment base, applied topically, has been used with encouraging results for a condition which has proved refractory to most other therapeutic agents.

232 *Bay 22nd Street.*

What Is Health?

HEALTH IS the accurate, harmonious, and constant integration of all the necessary biochemical factors in the body. The vitamin balance, the endocrine balance, the electrolyte balance, the control of the body temperature, the maintenance of the blood glucose level, and the supply of oxygen to the cells are a few of the important factors. A derangement of any of these or of any other biochemical system disturbs the harmony of the cells and results in ill health.

—Tom D. Spies, M.D.: JAMA **153**:185-193 (Sept. 19) 1953.

Paget's BONE DISEASE

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Philadelphia

DIGEST

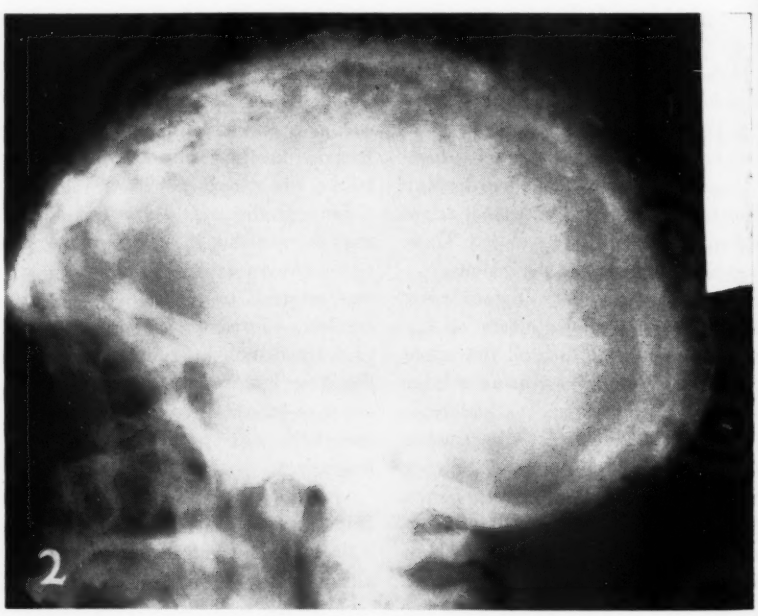
Identification of a disease by a person's name is considered incomplete because by this means neither a histologic, pathogenic, nor clinical description of the disease is provided. In the present instance, the term Paget's bone disease can only be used because the histologic picture is confused and the etiology unknown. Paget's disease has been referred to as osteitis deformans, and Sicher, because of the proliferative nature of the disease, suggests the term osteitis hyperplastica. The discussion of the condition in this article, drawn from the author's observation, is related specifically to the dental aspects in the disease.

Nature of the Disease

A single bone or many bones may be involved. It does not extend across an articulation. When the bones of the face are involved, therefore, it is rarely the mandible. Because the condition is common to the bones of the head and can be detected in the routine dental radiographic examination it merits special study by dentists.

Later Stages Demand Medical Care—The early stages in particular are of interest to the dentist for once the disease becomes extensive, involving the long bones of the body, the patient requires medical care.

1. *Enlargement of the tuberosity in a case of Paget's disease that could be interpreted as an osteoma or simple exostosis.*



2. *Areas of condensation and rarefaction giving the skull a cotton wool-like appearance. Note the original outline of the calvaria.*

Misleading Diagnosis Can Be Avoided—If the disease can be identified in the dental radiograph the patient will be spared the inconvenience of a misleading diagnosis. Many of these cases are classified as hypertrophic arthritides and treated as such until the disease manifests itself in its disfiguring symptoms.

Symptoms

1. The bone changes include alternate rarefying and condensation of the bone, resulting in an indicative radiographic picture.

2. Clinically bulbous or massive enlargement of the edentulous ridges (Fig. 1) may be found which may be misinterpreted as an exostosis or osteoma.

3. If the disease involves the head the patient is forced to purchase larger hats, and where the feet are involved, larger shoes.

4. A radiograph of the skull reveals the areas of condensation and rarefaction of bone presenting the typical cotton wool appearance characteristic of the disease (Fig. 2). (Note the original outline of the calvaria.)

5. The onset of the disease occurs after the fortieth year. Both sexes are affected. The involvement of the skull and bones of the face give the patient an appearance that is similar to acromegaly or leontiasis ossea. The involvement of the long bones causes bending and bowing, the patient assuming an ape-like posture and gait (Fig. 3).

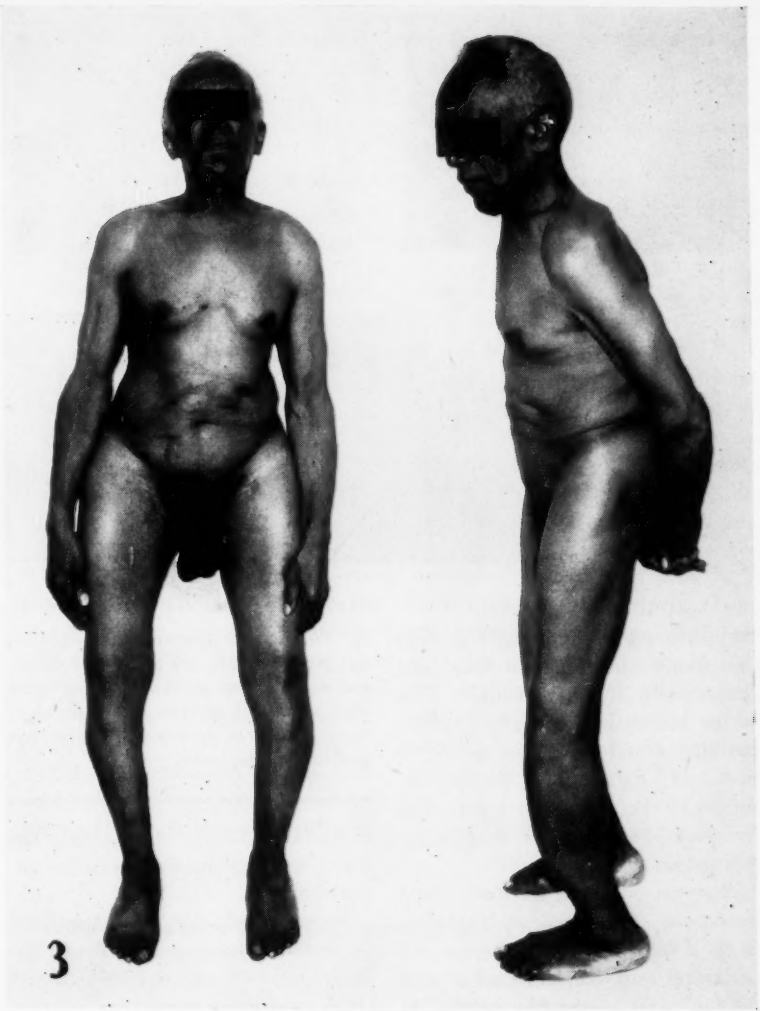
Patterns Noted in Radiographic Study

In the dental radiograph the author has observed two distinct patterns:

Type One—The bone pattern has a reticulated or orange skin appearance. The trabeculations are finely meshed and run in one direction, from the distal superior aspect to the mesial inferior.

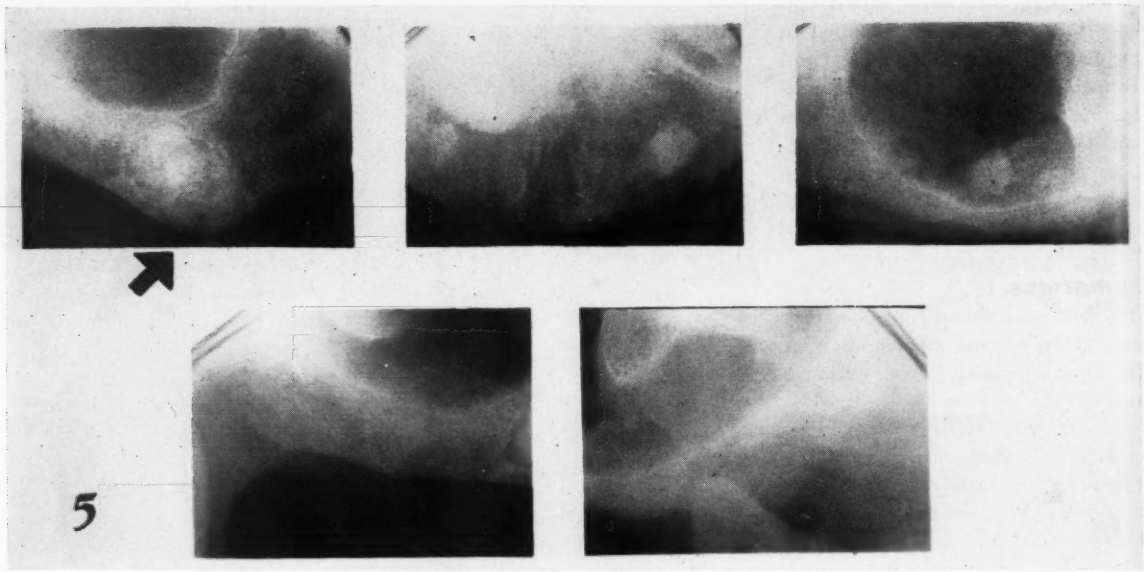
Type Two — Areas of rarefaction and condensation are present in the second type as well as hypercementosed roots.

Radiographic Pattern Characteristic in Type One—To a dentist who uses the radiograph study frequently,



3. ***Bending and bowing of the legs gives the patient an ape-like gait and posture.***

4. ***Reticulated or orange skin pattern of the bone as seen in the dental radiograph.***



5. ***The pattern as seen in the edentulous patient. Note the areas of condensation. The arrow indicates an area that protrudes on the labial plate of bone. This area appeared after the extraction of the teeth.***

the particular design noted in type one stands out from the usual and immediately attracts attention. This is the osteolytic or rarefying phase but the term hypotrophic period is preferred (Fig. 4). One patient, observed by the author for a period of five years, has continued to maintain this pattern.

Recommendations for Radiograph Technique—It is recommended that in a suspected Paget's disease the periapical radiographs be taken with the long axis of the film parallel to the long axis of the roots of the teeth in the bicuspid region. Such a view reveals more of the alveolar supporting bone, especially that free of the maxillary sinuses and nasal fossae. In addition, the paralleling technique with long target film distance is particularly useful for eliminating the latter anatomic landmarks in the incisive region.

Paget's Disease of Spine Suspected—Another patient, whose dental radiographs were referred for interpretation, was being treated for arthritis of the spine. Unfortunately, it was not possible to follow the case to completion. On a basis of the dental pictures Paget's disease was suspected involving the spine and studies for such would be recommended.

Study of an Edentulous Case—The bony protuberance noted in the radiographic study shown in Figure 5, indicated by the arrow, is more pronounced on the buccal plate of bone and developed, according to the patient's history, after the teeth were removed. Full upper and lower replacements were present but the upper one could not be inserted although it was serviceable when first completed. Following the removal of the exostosed area a new set of dentures was constructed but it was necessary to inform the patient that new areas can be expected to develop or that the same one may return.

6. ***Paget's disease. Note the reticulated pattern of the bone and the hypercementosed teeth. Also note the residual areas of condensation.***

Factors in Differential Diagnosis

The laboratory test for Paget's disease is an alkaline phosphatase determination of the plasma. Normally the blood contains four Bodansky units but in Paget's disease values range from 50 to 135. In active rickets the value may vary from 30 to 165. This becomes a factor, therefore, in the differential diagnosis.

Radiograph Patterns in Type Two

In addition to the areas of rarefaction and condensation noted in radiographic study of the second pattern encountered, as stated previously, hypercementosed roots may be seen (Fig. 6).

Hypertrophic Stage — The overgrowth of the cementum gives the apexes a golf club head shape. This is the hypertrophic stage.

Possibilities From Pulp Disease—The areas of condensation, particularly those seen at the apexes of the teeth, introduce the possibility of multiple cementoblastomas and bone condensations due to pulp disease. In the latter category thermal and infective hyperplasia may also be present.

Specific Considerations

No known cure exists for this disease. In 6 to 10 per cent of the cases death has been a result of osteogenic sarcoma.

Dental treatment for these patients becomes a problem. Extractions are difficult because of the hypercementosed roots, whereas the proliferation of the alveolus makes the production and maintenance of a prosthesis extremely difficult.

Summary

Recognition of Paget's bone disease is presented on a basis of the bone pattern as seen in the dental radiographic studies. Two distinct patterns are evident: (1) a reticulated or orange skin effect, and (2) a type that reveals areas of rarefaction and condensation.

Aids in Differentiation—The presence of multiple hypercementosed roots aids in differentiating Paget's disease from other osteolytic lesions. The differential diagnosis should include acromegaly, leontiasis ossea, multiple cementoblastoma, multiple thermal and infective hyperplasias, exostosis, and osteoma.

Factor in Diagnosis—An alkaline phosphatase of the plasma should be determined, values of 50 to 135 being diagnostic. The presence of this enzyme in figures of 30 to 165 as seen in rickets must be considered.

Cause and Treatment Unknown—From the standpoint of the dentist the treatment needed can conform only to the situation as it exists for the present and near future. If there are any hyperplastic areas that interfere with the construction of a prosthetic replacement they must be removed but it must be impressed upon the patient that changes will occur that will necessitate the remaking of the dentures. Periods of remission are followed by periods of activity that produce the bony changes symptomatic of the disease.

1002 *Medical Arts Building.*

Preanesthetic Evaluation of the Oral Surgical Patient

C. WILLIAM VIZE, B.S., D.D.S., LL.B., Urbana, Illinois

Operative Experience Invaluable

Proper preanesthetic evaluation of the patient about to undergo elective oral surgery requires knowledge of the fundamentals of anesthesia and general medicine as well as of oral surgery. Complicated cases may require consultation of specialists in all three fields.

Minimal Disturbance to Normal Physiology—Prevention of death is not all that is required. Postoperative morbidity involving brain, heart, or lung tissue can follow only slight degrees of hypoxia or leakage of a small amount of blood or fluid around the mouth pack. It is the duty of the anesthetist to ensure minimal disturbance to the normal physiology, neither initiating nor contributing to disease processes.

Preoperative Evaluation—A printed questionnaire may be given to all patients with checks to be made on points such as the following:

(1) Principal respiratory and circulatory diseases

(2) Diseases of liver and kidneys

(3) Diseases of metabolism

(4) Diseases of the central nervous system

(5) Principal symptoms such as pain in the chest, shortness of breath, headache, dizziness, memory defects

Preoperative Tests—The surgeon or his assistant should note the following conditions:

(1) The hemoglobin content, (a comparison of the color of the palm of the patient with that of the surgeon or assistant is a rough guide)

(2) Pulse, temperature, and respiration

(3) Blood pressure

Observation—Something of the patient's age, weight, condition and color of skin, degree of oxygenation, mental attitude, and nutritional state can be told at a glance. An evaluation and examination of the airway, both orally and nasally, should be made.

Advantages of Preoperative Examination—The system of checks described is of definite value and may restrain the surgeon from inflicting anesthesia on a physiologic and pathologic stranger.

Minor General Anesthetic Nonexistent—If a patient goes completely to sleep the anesthetic is always major, and he must be returned to full consciousness if the anesthetic is to be successful. Both experiences may be fraught with danger and the actual length of the surgical procedure has little bearing on the hazards of induction and recovery.

(*Continued on page* 86)

BODY CHEMISTRY

in Health and Disease—Part Six

MELVIN E. PAGE, D.D.S.,
and D. L. BROOKS, A.B., St. Petersburg, Florida

DIGEST

This installment, the sixth in the series, presents a practical discussion of the problems concerned in the procedures of processing, packaging, analyzing, and transporting blood specimens from one locality to another. Because of the refinements in measuring and analyzing techniques required in this approach to physical and dental health through the restoration and preservation of efficiency in body chemistry, extreme precision is observed in laboratory techniques. Directions are given in detail for the methods employed in withdrawing and bottling blood specimens and the underlying reasons for this highly meticulous and individualized approach developed by the authors is discussed.

Problems Encountered in Shipping Blood Specimens

Experimentation — Months were spent in checking, discarding, and searching for means and satisfactory methods. Preservatives of one kind provided accuracy for some tests but precluded it for others. Some methods would stand up under a three-day interval between the taking and analyzing of the blood; a five-day interval, however, was required to allow for distance and possible postal delays.

Solution of Problem—As a choice of methods became narrower, double amounts of blood were withdrawn from staff members. One-half was analyzed, the other half shipped and returned for analysis. Results were compared. Success was finally achieved in matching results of the initial analysis with that of the delayed analysis.

Present Equipment—A light balsa wood container as protector for the blood specimens is now used (Fig. 48). Silver-lined bottles within this container travel without damage. A glass slide for a blood smear fits a slot in the container. Preservatives baked into the bottles plus the germicidal effect of the silver bottle lining ensure proper preservation. The following details are carefully considered:

1. Air Mail shipment, Special Delivery, ensures prompt receipt of the blood samples.
2. Minute alterations in kit preparation for the hot months dispose of weather vagaries.
3. Detailed instructions for handling are included with each kit.
4. The only variable without control is the human element: instructions must be followed with meticulous exactness; there must be no tampering with blood tubes, nothing added, nothing taken away.

Tests to be Determined After Shipping—The only tests desired for this work which are not obtainable on shipped blood samples are sedimentation rate, blood pH, and platelet counts. The former can be done with little equipment or trouble at the point of departure. There are various acceptable techniques for determining the sedimentation rate. The authors find the Clay Adams Micro Sedimentation Rate method most acceptable. Additional tests for cholesterol or uric acid can be obtained upon request.

Directions for Handling Shipped Blood Specimens

Each shipping case contains two silver vials (one for whole blood, the other for plasma), a slide for making a blood smear, and a smaller clear vial which holds an adequate amount of sodium citrate (90 per cent saturated solution) for the prevention of coagulation. The following steps are taken:

(1) *To Withdraw Specimen*—Use a 20-cubic centimeter syringe and a 23-gauge ½-inch needle. Sodium citrate is drawn into the syringe. Hold the syringe in a vertical position with the needle up. Pull the plunger the entire length of the barrel. Push all the air out. Push the plunger to the end of the barrel, leaving only the citrate remaining in the neck of the syringe and needle. (This leaves approximately three drops of sodium citrate which is enough to prevent coagulation.) Draw 10 cubic centimeters of blood by venous puncture. Remove the needle from the syringe and inject the blood into the centrifuge tube, or stopper the tube and invert several times to mix the blood thoroughly with the anticoagulant. Inject the blood into a centrifuge tube.

(2) *Differential Count* — Put a small drop of blood on one end of a prepared glass slide. Place a second slide across the first one, holding it at a 45-degree angle. As soon as the blood is spread entirely across the end of the spreader slide, with a rather quick movement (push, do not pull) the spreader to the other end of the lower slide. The resulting film should be even, neither too thin nor

too thick (the smaller the angle between the two slides, the thinner the smear will be). Permit the blood to dry. When dry put back into the slot in the shipping case and tape.

(3) *Place Specimen in Vial*—Mix the remaining blood again. *Immediately*, while the blood is still well mixed, put 1 cubic centimeter of the whole blood into the vial marked *Whole Blood. Do not put in more blood.* Only enough preservative is used to take care of 1 cubic centimeter of blood.

(4) *Centrifuge Remainder*—Centrifuge remainder of blood for 10 minutes at approximately 1250 RPM.

(5) *Attach Information to Package*—Before removing the plasma from the centrifuged blood, record the reading of the total column in CM; also record the reading of the packed red cells. Attach these two readings to the outside of the block together with the patient's name, the doctor's name, and the date. Note any special requests.

(6) *Removal of Plasma*—Remove the plasma by medicine dropper *with care.* Do not disturb the layer next to the red cells. If this layer is disturbed, red cells will mix with the plasma and cause deterioration preventing accurate analysis. *For tests 3 to 4 cubic centimeters of plasma are required.*

(7) *Measures to Prevent Breakage*—Cap bottles securely to prevent spilling. Put vials back into the shipping case and tape with scotch tape to prevent breakage.

(8) *Shipping Instructions* — Ship immediately Air Mail—Special Delivery. Avoid arrival at destination during a week-end.

Accurate Analysis Ensured—Blood specimens handled in the manner outlined are capable of accurate analysis when shipped from South America, Central America, and from any state in the United States.

Reasons for Procedures Employed

The question is often asked, "Why cannot blood specimens be analyzed locally?" The answer is not difficult to understand. Failure to understand, however, indicates failure to grasp the underlying fundamentals of this technique, its basic difference from any other approach.

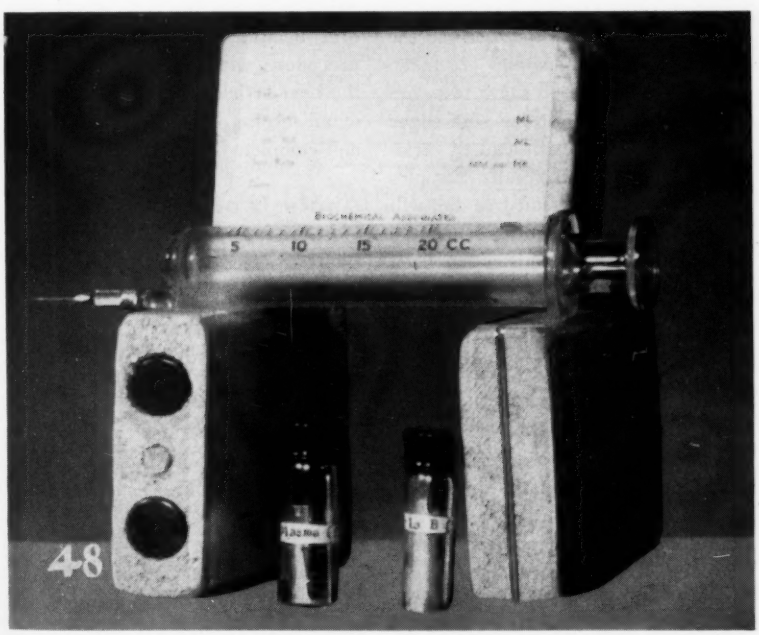
Skills Adapted to Craft—No one expects a blacksmith, however skilled he may be in his own craft, to be equally skilled as a repairer of watches. The training for one field is not concomitant with training for the other. So it is with laboratory techniques. The methods currently in use among commercial laboratories are eminently satisfactory for the purpose required.

Refinements of Methods Required—If the purposes of this approach to bodily ills are to be achieved, refinements of the laboratory techniques in common use must be applied. The differences between a skilled blacksmith and a skilled watch repairer is suggested advisedly. No reflection is cast upon ability or training, merely the necessity of adjusting the means to the end.

Exactness in Technique—Generally speaking, according to both textbooks and commercial laboratories, phosphorus levels ranging from 2.5 to 5, calcium levels from 9 to 11, and blood sugar levels from 80 to 120 are within normal limits. Obviously, analysis techniques need not be too exacting to obtain results falling within these widely spaced ranges. In contrast, the procedure under discussion requires the establishment of definite ratios between calcium and phosphorus levels.

Basis for Treatment—Treatment is judged on the basis of changes in calcium-phosphorus ratios. Consequently, exactitude in testing is imperative. To this end our laboratory technicians are trained in refinements of techniques. It is not to be expected that well-trained commercial laboratories, unaware of our findings and purpose, should reorganize their entire schedule of procedures upon occasional request. Their present technique satisfies the usual demands. Why should they change?

Normals Usually Averages—Why does this procedure set its findings on calcium-phosphorus and blood sugar levels above those generally accepted? Generally speaking, the so-called *normals* constitute *averages.* Statistics on disease indicate that the *average per-*



48. ***Balsa wood blocks showing both ends and one side. In one end is the slide for blood smear. In the other end are two silver-lined bottles, one for plasma and one for whole blood, and a small bottle containing 90 per cent saturated sodium citrate. The syringe is a 20-cubic centimeter with a 23-gauge ½-inch needle.***

son is not a well person. Health is the exception, not the rule: a significant commentary on contemporary civilization.

Recognition of Health—Most health procedures are founded on attempts to understand disease. The present method is based on an attempt to recognize health, to establish an index of chemical efficiency, to guide the person so that his body may of itself achieve well-being.

Factors Pertaining to Accuracy

A calcium-phosphorus ratio of 10 to 4 (2.5 to 1) is used by the authors as an index of efficiency. Since such a ratio permits optimum conditions for health of bone and hard dental tissues, there is a goal at which to aim, a basis from which to evaluate regression or progression in treatment. An error of .5 milligram in reading calcium-phosphorus levels would make this procedure valueless. The need for accuracy in measurement technique and blood analyses cannot be too strongly emphasized. The value of this approach is dependent upon these tools; its success rests upon the experienced interpretation of their results.

Commercial Solutions Unsatisfactory—Blood sugar determinations are run with a standard which serves as a basis for calculating the results. In general, commercial laboratories use a purchased sugar solution or make their own solution weekly. Either way deterioration occurs. Readings from this material differ between Monday and Saturday. When delicate adjustments in endocrine treatment are being regulated on the basis of such analyses, response is unsatisfactory.

Results Demonstrated by Experience—That the results of commercial laboratory techniques were unsatisfactory was learned by experience. A patient with a difficult chemical problem was permitted to return home for a visit. During the visit frequent blood sugar readings taken locally were to be used to guide regulation of treatment dosage. It was known that calcium-phosphorus readings taken elsewhere would be unreliable; it was assumed that blood sugar readings would be accurate. Four days before the patient's planned return former symptoms reappeared. Blood sugar readings taken locally and within twenty-four hours at our laboratory differed markedly despite controlled diet. Treatment had been altered on the basis of misleading information. The results were disastrous.

Discrepancies Noted in Comparison—As a further check, cooperating physicians in other localities took extra blood. Analysis for blood sugar was done locally and repeated on the shipped blood specimens. Divergencies were marked.

Only Fresh Standard Solution Used—In our laboratory the technique for blood sugar determination requires the actual making of *a new standard solution* from fresh materials for each batch of blood sugar specimens which is analyzed. The standard is not held even for a matter of hours. Each standard is fresh for each series of analyses.

Tests Made Under Working Conditions—Contrary to usual procedure, the patient's sugar-metabolizing mechanism is being tested, not under unnatural or fasting conditions, but under *working conditions.* Control of the situation rests in the diet and the fact that all blood samples are taken in the morning. Blood sugar tests run under working conditions with sugar or fruit in the diet will lead to variations in blood sugar results. Samples run on a sugar and fruit-free diet will maintain the 100 reading when the efficiency of body chemistry has been stabilized at a high level. Hundreds of records provide incontrovertible proof of this fact.

Requirements in Learning Technique

It is not at all impossible for a physician, dentist, osteopath, or technician to learn the requirements of the laboratory technique required in this approach. If the tests must be made, however, by a laboratory without supervision from the practitioner of this technique there can be no control over procedures. Experience has proved the fallibility of this method.

Experience in Laboratory Methods Necessary—If the practicing physician, dentist, or osteopath does not have a background of continuous experience in laboratory analyses in addition to experience in this method he lacks the knowledge for close supervision of his own laboratory. He cannot recognize the signs of inaccurate technique.

Consultative Guidance at Cost—Laboratory equipment is expensive, technicians capable of improving their techniques are rare. These circumstances make the analyzing of blood specimens, except in quantity, prohibitively high in cost. It is for this reason that laboratory service is offered with consultative guidance at cost to those who wish to learn this work. To many even cost seems high at present. It is hoped that with progress in new equipment this figure may eventually be reduced. However, until the dependability of other methods is proved, thirty years' research and the opportunity to provide service cannot be jeopardized. We will continue with the proved methods while searching for improvement.

Aid in Learning Technique—Complete posting of blood samples is an aid in learning this technique and a guide in practicing this approach to oral health. Understanding of this procedure will be found helpful for the next article which will discuss in detail several dental patients' histories and complete blood studies.

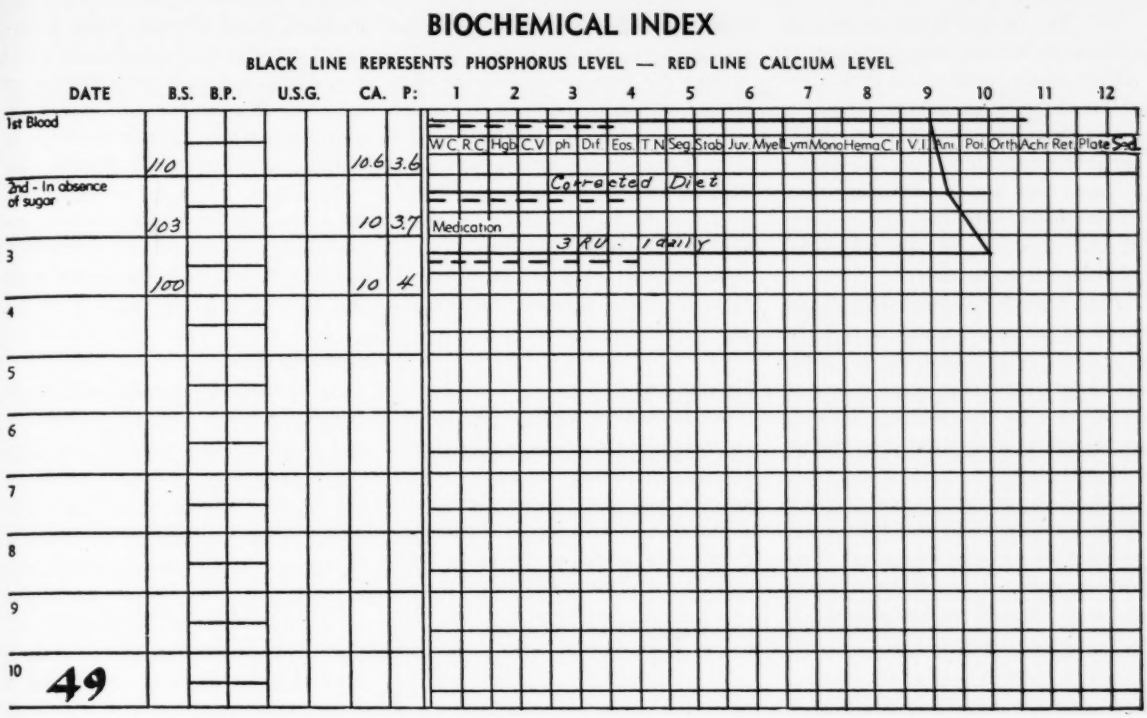
Analysis of Figure 49

At the top of the Biochemical Index Chart is space for the original blood test for the patient prior to correction of diet and the discontinuance of sugar. This test may be omitted if deemed advisable. Its value, however, is two-fold:

(1) It demonstrates to the patient the effect which diet alone may have on the efficiency of his chemical mechanism.

(2) The extra blood sugar report is of value in determining the efficiency of the sugar-metabolizing mechanism of the individual patient.

Meaning of Letters—The initials across this index chart (Fig. 49) taken in order stand for: B.S.—Blood Sugar; B.P.—Blood Pressure; U.S.G.



49. *Biochemical Index.*

—Urine Specific Gravity; CA.—Calcium; P.—Phosphorus.

Differential Analysis — The small letters in the small spaces are abbreviations for the various tests. The figures in parentheses represent the normal values for each. WC - White Count (6000); RC - Red Count (4,500,000-5,000,000); Hgb. - Hemoglobin (100); C.V. - Cell Volume (43-45); pH - Blood pH (7.4); Dif. - Differential; Eos. - Eosinophils (2-4); T.N. - Total Neutrophils (55-70); Seg. - Segmented Cells (58-66); Stab - Stab Cells (2-4); Juv. - Juvenile Cells (0-1); Mye. - Myelocytes (0); Lym. - Lymphocytes (21-30); Mono. - Monocytes (4-8); Hema. - Hematocrit (-); CI - Cell Index (1); V.I. - Volume Index (1); Ani. - Aniscytosis (-); Poi. - Poikilocytosis (-); Orth. - Orthochromatic (-); Achr. - Achromatic (-); Ret. - Reticulocytes (-); Plate. - Platelets (225-250); Sed. - Sedimentation (2-6 men; 3-15 women).

Calcium-Phosphorus Level—A solid black line is used to represent the calcium level for each test. This line is drawn from the unmarked zero to the figure obtained for a given analysis. For example, in Figure 49 the calcium of 10.6 is drawn out to slightly beyond the half-way point between 10 and 11. The phosphorus level obtained on the same analysis was 3.6. Show this by a dotted line drawn from the unmarked zero to slightly more than half-way between 3 and 4.

Obtaining Usable Level of Calcium —Now multiply the phosphorus level of 3.6 by 2.5 to obtain the *usable* level of calcium. (Phosphorus uses calcium at the rate of 2½ times itself.) The answer here is 9. Place a dot at this point. The difference between the pencil dot at 9 and 10.6 is the amount of *excess* calcium.

Process Repeated—For the second blood test repeat the process described. Draw out the solid calcium line to 10. Place the dotted phosphorus line below it to 3.7. Estimate the usable calcium level, 9.25. Place the dot. Now connect the pencil dot for tests 1 and 2. The improvement achieved between these two tests can be appreciated at a glance. There is only .75 milligram of *excess* calcium.

Succeeding Blood Test—Complete the next blood test, but here note above the test what endocrine treatment was used to achieve the change in blood levels. Connect the pencil dots for the usable compound level at each step. *A decrease in the amount of excess calcium means progress; an increase retrogression. The presence of excess phosphorus is a warning to alter treatment so that this high level will not continue. It is in the presence of excess phosphorus that most acute pathologic conditions occur.*

Factors Controlling Procedural Steps

Progress in reduction of excess calcium is often clear, thereby making the next step in procedure clearcut. There are, however, two factors to be remembered:

(1) Adverse information concerning the patient's response may be fully as important as confirmation of correct endocrine choice. Since an overactive gland can be inhibited by use of its opponent, adverse results from one endocrine may clearly point to the correct endocrine. Furthermore, adverse effects are more quickly discernible in symptoms and from blood analyses than good effects. This is a fact which can be used to advantage in many instances.

(2) The second factor to be considered in determining progress in calcium-phosphorus ratios is whether or not there is an increase above or below the optimum 30 quotient obtainable from *multiplying the usable calcium* level by the *existing phosphorus level.* (On the first reading on this chart, Figure 49, 3.6 multiplied by 9 equals 32.4.)

Indication for Caries—This figure is of importance because experience has shown that immunity to dental caries pertains if this figure is *held* at 30 or more but susceptibility to caries occurs when the quotient drops below this optimum level. Therefore, if in doubt as to whether or not progress is being achieved (1) note increase or decrease of excess calcium or phosphorus, and (2) lay a ruler along usable compound points and determine whether this level is rising or dropping. (Connected dots on chart.)

Basis for Comparison—It is necessary, of course, to use the blood analysis taken in the absence of sugar and prior to endocrine treatment as a base level for comparison of future blood tests for determination of progress. The initial test in the presence of sugar may be used for purposes of illustration and education of the patient.

Comment

Occasionally in a graph with mixed endocrine dysfunction, a hypofunctioning gland may be compensated for by a hyperfunctioning gland even to the degree that the first calcium-phosphorus blood levels show balance. However, blood imbalances will be noted in the sugar reading; for example, some change in the differential count or in the cholesterol reading. Initial endocrine treatment in a case of this nature will result in an unsatisfactory calcium-phosphorus balance, perhaps worse than in the original test. When the remainder of the endocrine treatment has been established, however, calcium-phosphorus balance will return to normal with loss of original symptoms.

Conclusion

An appreciation for the need of accuracy in blood analysis techniques and understanding of graph interpretation and blood posting procedures will be of assistance in following patient studies in the next article.

2810 *First Street North.*

The Role of Vitamins in Nutrition

VITAMINS are organic compounds required for the normal growth and maintenance of the life of animals, including man. As a rule, the vitamins cannot be synthesized by the tissues in the animal body, hence must be fed. They must be regularly provided in an organic form which can be utilized by body tissues directly, or after chemical alteration which the tissues can achieve.[1] Animal and plant foods are the natural source of these nutrients for man.

Vitamins do not provide energy as do proteins, carbohydrates, and fats, yet are essential for utilization of energy within the body. Vitamins are not utilized as building units for the gross structure of body tissues as are proteins, carbohydrates, fats, and many inorganic elements and compounds, yet are essential for the chemical reactions by which structural units are formed and function throughout life.[1, 2]

The biologic functions of the vitamins are effectively performed by small amounts of each, the actual requirement being dependent upon one or more of the following factors: (1) stage of growth; (2) body size; (3) conditions of environment; (4) composition of diet with respect to other nutrients and non-nutrient substances; (5) total food intake; (6) the form and manner in which the vitamin is provided; and (7) the metabolic state of the subject.

From *Dairy Council Digests* **25**:1 (Nov.) 1953.

[1]Rosenberg, H. R.: Chemistry and Physiology of the Vitamin, New York, Interscience Publishers, Inc., 1945.
[2]Clark, G. W.: A Vitamin Digest, Springfield, Illinois, Charles C Thomas, 1953.

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TRICHLOROETHYLENE ANALGESIA

in One Thousand Dental Cases

M. H. DANKOFF, B.A., D.D.S.
and M. WEINGARTEN, M.D., Rochester, New York

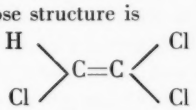
DIGEST

This discussion of analgesia which provides one of the most effective means of establishing the patient's confidence in his dentist is based on knowledge gained from the employment of trichloroethylene analgesia in more than one thousand cases in general practice. Previous to this study one of the authors (M.W.) had extensive experience with the drug in hospitals in Canada and the United States; the other (M. H. D.) used it several years as an adjunct to nitrous oxide-oxygen in general anesthesia in office oral surgery.

Specific Considerations in Analgesia

Definition—Analgesia is the loss or diminution of pain without loss of the sense of consciousness or of touch. Use of the analgesic agent, trichloroethylene, is also frequently attended by loss of memory.

Formula—Trichloroethylene is a halogenated, unsaturated hydrocarbon whose structure is



Properties—Because of its high boiling point of 87° Centigrade (188.6° Fahrenheit) a small quantity of the agent will last a long time.

Color: The purified commercial preparation as supplied for analgesia or anesthesia is artificially colored blue to distinguish it from chloroform.

Odor: The agent possesses a pungent odor; it is generally acceptable, however, or even pleasant after the first few breaths.

Potency: It is one of the most potent analgesics known. If used in a simple apparatus, however, dangerously high concentrations will not usually be obtained.

Storage: Decomposition is hastened by light, heat, and air; storage should therefore always be in a tightly stoppered amber bottle away from heat. Under no conditions should trichloroethylene be introduced into a system containing soda lime or baralyme, since this combination results in the formation of explosive dichloracetylenes and phosgene, which is extremely toxic when inhaled.

Explosive Propensities: Trichloroethylene is not explosive when used with air or with the usual concentrations of nitrous oxide-oxygen. If used with 100 per cent oxygen, however, the possibility of explosion becomes a calculated risk.

Induction—With this agent induction is usually nonirritating, rapid, and pleasant if the administrator is skilled and has mastered the fundamental principles of trichloroethylene usage.

Recovery—After short administrations recovery is rapid and complete and the incidence of nausea is infrequent if the drug is given judiciously and if there has been no anoxia.

Elimination—Virtually all the drug is excreted unchanged via the lungs during exhalation. Consequently, unlike intravenous analgesics or anesthetics, if deeper planes are inadvertently obtained, they are easily reversed by permitting the patient to inhale pure air or oxygen and exhale the mixture.

Systemic Effects

Respiratory rates of over 50 per minute serve as a warning of overdosage, as do pulse rates of over 100 per minute or under 50. In deeper planes, eye movements may persist and the pupils do not always dilate.

Cerebral Damage—The danger of subclinical cerebral damage, such as may occur with nitrous oxide, should not be a hazard with trichloroethylene if a deficiency of air or oxygen is never tolerated. A pulse rate over 100 or under 50, or any degree of cyanosis, is often evidence of anoxia and requires the administration of oxygen for correction or temporary discontinuance of the analgesia.

Renal Function—The drug does not affect renal function. Liver function, however, may be temporarily impaired to some degree. Thus the administrator should avoid use of the agent in patients with known hepatic disease.

Cardiac Effects—Cardiac irregularities are fairly common with trichloroethylene as they are with almost any analgesic or anesthetic agent given by inhalation. When these irregularities, or cardiac rates over 100 or under 50 per minute, persist, the warning should be heeded and the agent discontinued. Although many authorities are of the opinion that these irregularities are not of serious significance, it is wiser to be conservative.

Other Systemic Effects—There are no abnormal deviations in blood sugar, nonprotein-nitrogen, blood pressure, or amount of bleeding when this agent is properly employed.

Combination with Epinephrine—As used in dental local anesthetics, epinephrine probably has no harmful cardiac effects. But as some authorities believe that this combination

1. ***The inhaler is shown. The regulating wheel is on the right. The valve on the left prevents expired air from returning to the inhaler.***

with trichloroethylene can be dangerous, it should be avoided completely. The other vasoconstrictors are acceptable.

Indications for Trichloroethylene Analgesia

The preparation was used successfully by the authors for the following procedures:

1. Cavity preparation
2. Pulp capping, pulpotomy, pulpectomy
3. Crown preparation
4. Scaling for prophylaxis
5. Deep subgingival curettage
6. Changing postoperative dressings in impactions, cystectomies, and dry sockets.
7. Removal of sutures and bone spicules
8. Incision and drainage of infections
9. Wiring of jaw fractures
10. Removal of loose deciduous teeth
11. Removal of teeth on specific adults who were cooperative
12. Adjunct to local anesthesia in removal of teeth in apprehensive children or adults
13. Prolonged or difficult oral surgical cases

Many patients become weary under local anesthesia after a half hour or so and are apt to consider the operator unskilled or in difficulty when this period of time is exceeded. When a light plane of analgesia is maintained throughout the operation, the patient is more apt to remain relaxed, will usually lose all conception of time, and will remember little or none of the difficulties that may have been encountered.

Introducing Analgesia to the Patient

Success in the use of dental analgesia depends largely on psychologic preparation of the patient. The dentist should have the experience of analgesia on himself in order to have confidence and be able to describe the sensation to his patients.

Reassurance Necessary—Many people fear the unknown and are reluctant to venture. Some have a form of claustrophobia or feeling of suffocation when a nosepiece is put on the face. Others have a fear of blacking out or recall unpleasant experiences with ether anesthesia for surgery. These patients need constant reassurance that "all is going very well," that they are "taking it beautifully." A well-placed compliment is an encouraging factor.

Preliminary Explanation—If the technique and sensations are explained in advance, apprehension can be decreased and the patient inspired with confidence and a desire to try the analgesia. (1) Explain to the patient that this method of pain-elimination is becoming more commonly used, that it is pleasant and is replacing the needle and the long period of postoperative numbness. (2) Emphasize that he will not fall asleep, will hear, see, and be able to talk throughout the procedure. (3) Inform the patient that his mouth is never covered and that he is free to breathe outside air through the mouth any time he wishes. (4) Never use the word gas. Patients frequently associate the term with a feeling of asphyxiation. Rather, it should be explained that the substance is a vapor which is inhaled from the metal bottle.

Equipment

Inhalers—There are at present two types of trichloroethylene inhalers recommended for dental analgesia: (A) one designed for operator-controlled administration, and (B) the other for self-administration. Since this report was virtually completed by the time the self-administered inhaler was available, the present observations are based entirely on the operator-controlled machine. The comparative merits of the two machines cannot be discussed therefore except to comment (1) that the self-regulated and administered inhaler appears to have some advantage for use on the older child, or adult who is more intelligent and cooperative than the average, and (2) that the patient who must feel that he is in control of the situation at all times is also a better candidate for the self-administered technique.

Suction—Effective suction apparatus is extremely important. Salivation is often markedly increased and the patient cannot conveniently empty his mouth while drowsy. The saliva ejector on most dental units will usually suffice, or a surgical aspirator may be used. Excellent results have been obtained in decreasing excessive salivary secretion by having the patient take one or two 50-milligram tablets of Banthine® about an hour before his appointment.

Mouth Prop—A rubber block of the type used in general anesthesia is frequently useful when inserted between the jaws opposite the working side. This will help control the mouth opening and avoid tiring the temporomandibular joint.

Kidney Basin—If the analgesia is not hurried or pushed too far, nausea or vomiting rarely occurs. A basin in readiness for immediate use, should it occur, will avoid embarrassment to both operator and patient.

Local Anesthetic—A local anesthetic may be added, usually painlessly and without the patient's knowledge, when the need arises. Never use a solution containing epinephrine.

Technique of Administration

1. Sponge the nosepiece with alcohol, dry thoroughly, and apply a trace of essence of orange or peppermint to the inside with the moistened fingertip.

2. The exhaling valve is always left fully opened; the distal end of the rubber tubing is not attached to the inhaler at the beginning of induction.

3. Standing in front of the patient and visible to him, the operator requests the patient to hold the nosepiece snugly in place while it is adjusted to his satisfaction. If the patient is not willing to hold the nosepiece in place, substitute a local anesthetic. This person is probably not a suitable subject for analgesia.

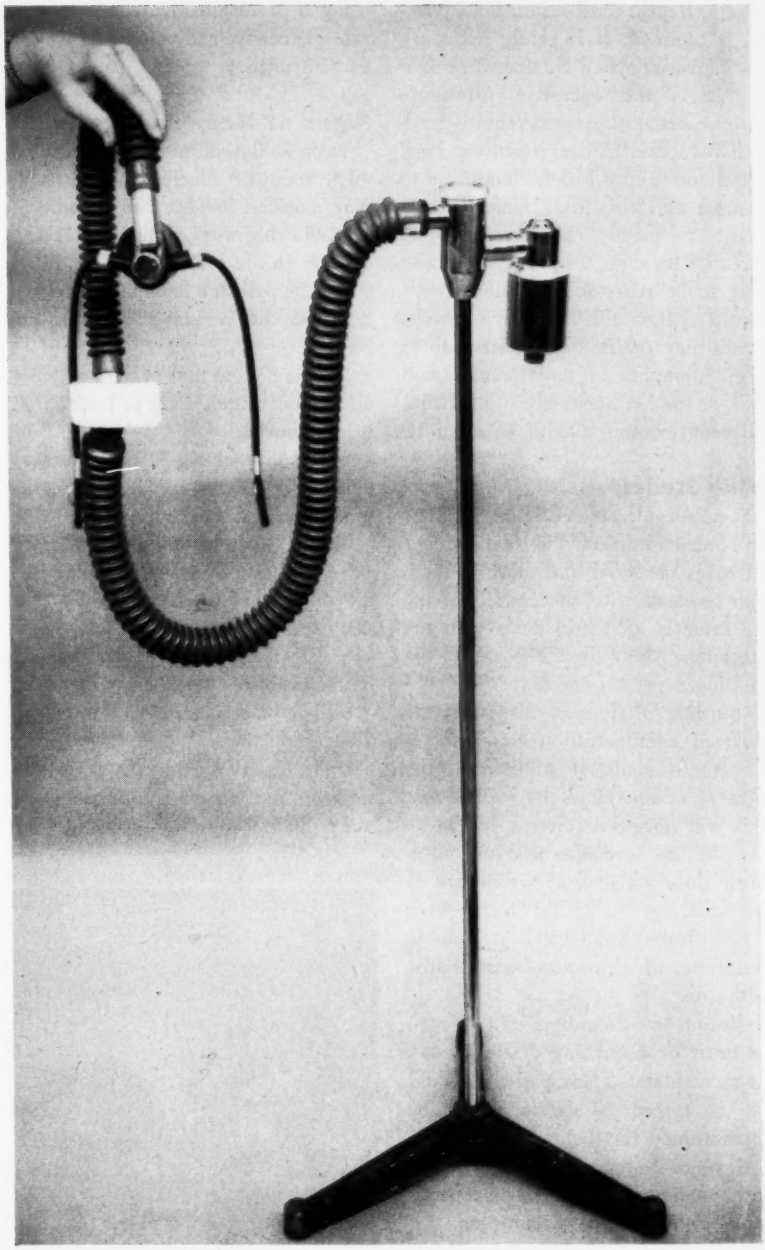
4. The patient is told to breathe slowly and evenly through his nose with the lips closed. (A few breaths of air at this time before attaching the tubing to the inhaler will eliminate any possible sense of suffocation.)

5. The pungent odor is more readily accepted if the subject is told that only the first few breaths will have a strong sweet odor; after that it will disappear or become agreeable.

6. Aerate the mixing chamber of the inhaler, attach the rubber tubing, and turn the regulating wheel half way to Number 1.

(If the inhaler is not aerated, the patient's first inhalation may be an extremely strong concentration of vapor that remained in the mixing chamber from the previous use. One forceful blow into the inhaler will expel it.)

7. After the first two or three breaths the patient is told that he will feel a warm pleasant glow; then a slight numbness or tingling will start about the lips and mouth and spread downward to the fingers and toes.



2. ***Complete apparatus: (1) nosepiece with head attachments, (2) stand with one-way valve, (3) inhaler.***

8. Call the patient's attention to the relaxation he is now experiencing and the sensation of floating in air. Children are especially open to the suggestion that the nosepiece is a space cadet's or pilot's mask and that they are floating off into the clouds. The hum of the dental motor is the sound of the space ship or airplane.

9. The concentration of trichloroethylene is gradually increased as necessary until the patient, when questioned, admits going through the stages mentioned.

10. Treatment is begun, advancing gradually into the more painful procedures as the patient's degree of narcosis permits. If pain is experienced, increase the concentration of trichloroethylene to the next higher number, allow half a dozen breaths, and try

again. Repeat until a satisfactory level is attained. It is rarely necessary to increase beyond Number 3 or 4.

11. As the operative procedure progresses most patients require gradual reduction in concentration. Lack of attention to this detail may lead to nausea and vomiting. Some patients must frequently be reminded to breathe through the nose; they also like to be reassured occasionally by being spoken to. The more relaxed types may prefer to be left alone to their thoughts or daydreams. Loud talk or sudden noises are to be avoided; conversation should be minimal.

Side Reactions

Undesirable side reactions are few in comparison with the total number of cases observed and most of them can be dealt with successfully if the operator is alert and deals with the situation skillfully. The following contingencies may arise:

Burning of Eyes or Nose—At the start of administration complaint is sometimes made of stinging of the nose or eyes. Assure the patient that this will disappear after a few more breaths. Be sure also that the nosepiece does not leak at the bridge of the nose.

Coughing—As analgesia progresses, coughing, which occurs occasionally, will stop.

Headache—Pounding in the head or heart or disturbing dizziness may be a complaint. These patients should not be forced; analgesia should be discontinued for that visit.

Crying—In the authors' experience, three patients subject to uncontrollable crying were encountered. All were young women. Use of trichloroethylene on these patients should be avoided as crying jags will probably be repeated.

Lacrimation—This is usually a sign of too light analgesia.

Hypersensitivity — An occasional patient may exhibit exaggerated reflexes and appear to be in considerable pain irrespective of dosage administered and under minor stimulation. This patient will be better off without trichloroethylene.

Excessive Salivation—By prescribing Banthine® preoperatively or by using a more effective suction apparatus, excessive salivation can usually be controlled.

Signs of Deep Analgesia

Deep analgesia precedes the excitement stage of general anesthesia. It may manifest itself in one or more of the following ways, although not necessarily in the following order:

1. The patient's head moves off the headrest and resists attempts to replace it.
2. The patient tugs at the nosepiece attempting to pull it off, or insists that it be removed.
3. An arm or leg is raised or extended rigidly and the patient begins to slide in the chair.
4. The eyes show a fixed stare straight ahead, or at the operator, and the patient is unable to respond to the operator's commands.
5. Breathing is irregular or extremely rapid.
6. The pulse is irregular, rapid, or extremely slow.

Upon observing that the patient is entering the excitement or delirium stage, do not remove the mask but detach the rubber tubing at its connection to the inhaler. Wait a few moments until he is quiet, then reattach the tube and proceed at a lower concentration. Remove the mask only if the patient tries to pull it off or asks that it be removed.

Individual Variations are Numerous

Patients exhibit extremely variable responses to trichloroethylene. While a concentration of 2 or 3 was adequate for most patients, an occasional one tolerated and required almost the maximum. Many more did as well on less than 1. When the patient's best dosage was determined, it was noted on his treatment record in order to facilitate administration at subsequent visits.

In the light of our present knowledge and with our present equipment we cannot hope to control *all* patients satisfactorily with trichloroethylene analgesia. Though approximately 90 per cent of our 1,000 trials were gratifying, the other 10 per cent fared better with other analgesics or with local or general anesthetics.

3. ***Patient under analgesia.***

Miscellaneous Suggestions

1. The dentist's confidence in analgesia and the technique he is using is absolutely essential for successful administration. If inexperienced in the use of analgesia, he should begin with a few selected patients who are the calm, cooperative, "I'll try anything once" type, who are most likely to show good results. In early trials do not use analgesia on the frightened patient. This will usually result in failure. Also limit early procedures to small cavities or other procedures which are simple, of short duration, and not likely to be very painful. Attention to these details will do much to dispel the patient's fears and give him confidence in analgesia. With each subsequent visit most patients become progressively more relaxed and receptive.

2. Occasionally a patient will drop into deep analgesia and exhibit a violent reaction to almost any manipulation. This is early excitement stage, hence do not give more. Cut off the trichloroethylene for a few moments until the patient is relaxed, turn to a lower concentration, and proceed operating. If, after two or three such attempts, the patient fails to level off into a satisfactory plane, do not force, but rather add a local anesthetic without epinephrine and keep the drug concentration at a minimum for the duration of the operation. Generally the patient will not consciously feel the injection nor remember any disturbing influences after regaining his faculties. Even if questioned, it is generally unwise to let him know that he was uncooperative or resistant. To do so may make subsequent administrations more difficult.

3. Never leave the patient unaccompanied before he has fully recovered, and always make certain that the patient is thoroughly clear and in complete command of all his senses before he leaves the office.

4. Nausea or vomiting occurs so infrequently that, in the opinion of one of the authors (M.H.D.) it is unnecessary to advise omission of the meal previous to the appointment. However, the other author (M.W.) cautions that the stomach should be empty. All four cases of vomiting that occurred were in our earlier trials, before we had acquired sufficient experience. Of these four, only one had eaten shortly before her appointment. Two of these might have been avoided had we realized that it is best to leave the stopper off the inhaler over night to permit complete evaporation of the remaining liquid. Long exposure in the metal bottle with air apertures probably caused decomposition of the trichloroethylene with formation of toxic end-products which resulted in illness.

5. None of the patients was requested to void before analgesia. No incidence of urination occurred during treatment.

6. Failure will almost certainly result from using analgesia against the patient's will or cooperation.

Some patients will not tolerate any analgesia or anesthesia. Others will insist on procaine. By proper approach most of them will be willing to try trichloroethylene. If, after a reasonable trial, the result is poor, or the patient expresses a strong dislike for its use, the procedure should be discontinued on that patient.

Conclusions

1. Fear of dental operations is one of the most important problems confronting the dentist.

2. Analgesia is rapidly establishing itself as a useful and short route to the elimination of pain and emotional factors encountered in general dental practice.

3. Trichloroethylene provides an inexpensive, safe, and practical analgesic agent. The simplicity of equipment required, ease of administration, wide patient tolerance and acceptance combine to make trichloroethylene a valuable addition in all dental offices.

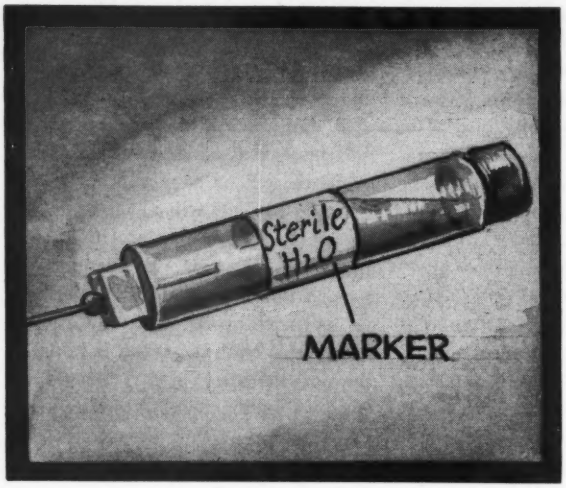
735 *Reynolds Arcade Building.*

Fluoridation of Water

THE AMOUNT of reduction in dental caries caused by the presence of fluorine in the drinking water should be viewed in perspective. Comparative studies show that much the greatest change in the incidence of dental caries is associated with alteration of diet. Even the reduction in dental caries experienced by many communities under wartime conditions was greater than could be expected from drinking fluorine-containing water. And the increase in dental caries observed since the war, an increase that seems to be continuing even now, would scarcely be reversed by the fluoridation of drinking water. Even so, such preventive measures as topical applications to the teeth are far less effective. Of the measures available, fluoridation of drinking water to a level that shows a decrease in caries without discoloration of the teeth would seem to be a most useful procedure. Although not every child would necessarily benefit from it, since the water intake might be below average, the greatest benefit to the greatest number of children would result, and its effect would last well into adult life. But in spite of this preventive measure dental caries will be a common disease and nearly everyone will need to have carious teeth treated annually.

Such a measure as fluoridation of public water supplies, entailing the treatment of a commodity consumed by almost everyone, is likely to be the center of warm controversy. Appealing to primitive emotions in which they have a vested interest, some politicians and publicists may try to divert public attention from the facts so far gathered.

From *British Medical Journal* No. **4827**:88 (July 11) 1953.



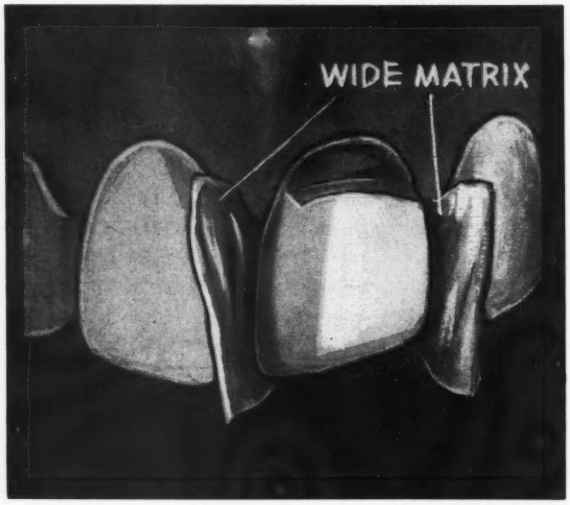
1

Clinical and Laborato

Flushing Injection Needles

Cyril B. Kanterman, D.D.S., Uniontown, Pennsylvania

1. To remove all traces of a cold sterilizing solution from the needle, place an empty anesthetic tube containing sterile water in the syringe and flush the needle before injecting the anesthetic. Label the tube of water to prevent confusion.

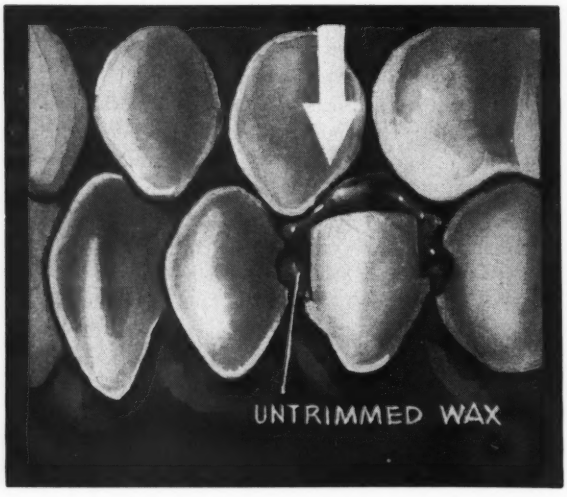


2

An Anterior Matrix

Herbert Ely Williams, D.D.S., Red Bank, New Jersey

2. For anterior upper gingival cavities involving proximal spaces, cut two pieces from a wide molar matrix band and place these pieces between the teeth. This will box in the cavity to make restoration simpler and to keep the proximal spaces free from the restorative material.



3

Indirect Inlay Technique

Charles H. Hughes, D.D.S., Garden City, Long Island

3. From a compound impression of the preparation make a suitable die. Place inlay wax in the cavity preparation and have the patient register the bite. *Do not trim the proximal.* Place the rough wax model on the die and finish trimming the pattern. The occlusion and the contact points have already been registered in the mouth.

READERS *are Urged to Collect* $10.00

For every practical clinical or laboratory suggestion that is usable, DENTAL DIGEST will pay $10.00 on publication.

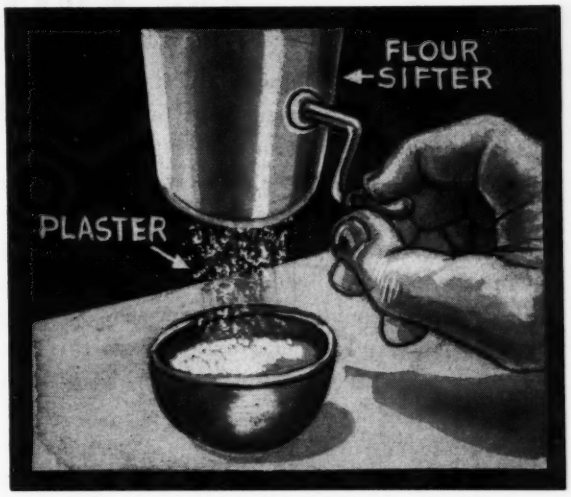
You do not have to write an article. Furnish us with rough drawings or sketches, from which we will make suitable illustrations; write a brief description of the

SUGGESTIONS . . .

Mixing Plaster and Artificial Stone

Samuel Newman, Halifax, Nova Scotia, Canada

4. When mixing plaster or artificial stone add the powder to the mix from a small flour sifter. This allows a more even absorption as well as less tendency for lumps and air bubbles to form.

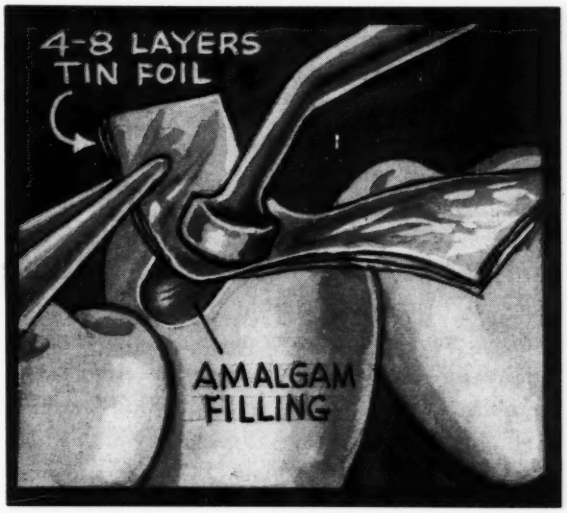


4

Absorbing Excess Mercury from an Amalgam Restoration

Charles B. Branson, D.D.S., Lincoln, Nebraska

5. Fold *thin* tinfoil into narrow strips of about ¼ inch in width and four to eight layers in thickness. Use this tinfoil as a "blotter" to absorb the surface mercury from the slightly overpacked restoration. The final condensation is done with the strip of tinfoil over the amalgam. The tinfoil quickly absorbs the mercury, leaving a dense surface for final carving and finishing.

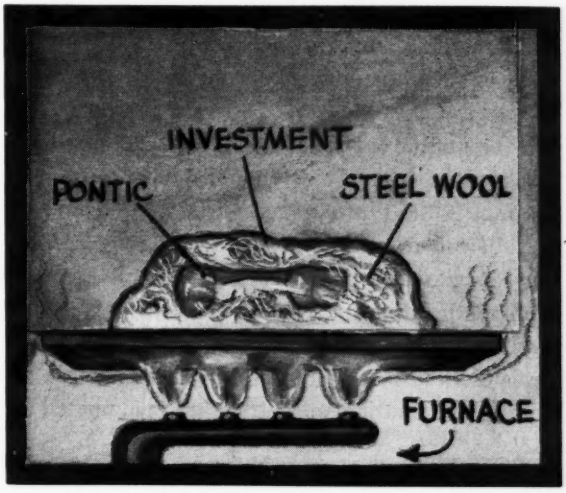


5

A Bridge-soldering Technique

Harry F. Tanner, D.D.S., Medine, New York

6. To prevent soldering investment from cracking during heating, mix steel wool with the soft investment before embedding the bridge parts in the investment.



6

technique involved; and jot down the advantages of the technique. This shouldn't take ten minutes of your time. Turn to page 88 for a convenient form to use.

Send your ideas to: Clinical and Laboratory Suggestions Editor, DENTAL DIGEST, 708 Church Street, Evanston, Illinois.

The EDITOR'S Page

READING a book on a clinical subject is a poor substitute for direct demonstration or experience. Reading, however, is often a more rewarding experience than listening to a lecturer. In the case of reading one may return again and again to the printed word to explore for clearer meaning. While listening to a talk the listener has only one chance; if he misses the point it is gone forever. This applies particularly to dental programs in this age when discussion and question-answer periods seem to have lost popularity.

One could not expect to become a periodontist after reading a book on the subject. If a dentist is lacking in the fundamental scientific information he would have a difficult time acquiring knowledge and skill by reading alone. If his fundamental knowledge is sound, if he has good clinical sense, he may learn principles of practice from reading that may be successfully translated into action. Such a helpful book on periodontology has been written by Frank E. Beube.[1]

Beube expresses the view of an experienced clinician who seems not to be disposed to ride any particular enthusiasm or theory too hard. The clinician, as distinguished from the histopathologist, will find the freedom from photomicrographs compensated by the presence of many fine clinical photographs. In addition, the high-sounding jargon of the biologist's laboratory has given way in this book to a series of "technical hints." The average practitioner who treats patients rather than stares into a microscope will appreciate this practical emphasis.

As a minor note of criticism, it might be added that the material on nutrition is too fragmentary and superficial. In addition, the section describing the use of animal bone powder for tissue repair might have been developed more fully.

"The author has reported that bone powder provides mineral salts and other essentials for bone healing. If the powder was not implanted into the radiolucent area, fibrous healing might result because of insufficient availability of calcium salts from the neighboring tissues. Fibrin foam acts as a binder for the bone powder, because of its affinity for calcium which is therefore better retained in the area. Better clotting properties are contributed by thrombin, which also adds in retention of the mixture. Powdered beef plasma may be substituted for fibrin foam and thrombin." The rationale in this surgical method would appear to be sound. The clinician would appreciate more information on the biologic and the operative phases of this treatment.

A commonly neglected phase of periodontal management, the use of splints and wire ligation, is well developed by Beube:

"Destruction of alveolar bone and periodontal membrane fibers in cases of periodontal disease, such as periodontitis and periodontosis, frequently leaves the teeth inadequately supported. Loosening of the teeth is also a common accompaniment. The functional pressures on the teeth, which are transmitted to the attachment apparatus during mastication and swallowing, and probably more important, the afunctional activities, such as the compulsions of clamping and grinding, cause further damage to the weakened periodontium, resulting in additional tissue loss. As a result, there is increased mobility of the affected teeth. A cycle of progressive destruction and increasing mobility is started. The rate of destruction is hastened as the condition progresses. Unless the disease is arrested in time, through complete therapy, the affected teeth will be lost.

"When periodontal treatment is started before extensive damage has occurred, most cases will fully respond to the prescribed therapy. Natural repair processes often heal the tissues; bone and soft tissues will frequently regenerate and provide support for loosened teeth, which then become more stabilized in their alveoli. Scaling, curettage, and selective tooth grinding are adequate for removing primary sources of trauma, and surgery eliminates infected and useless tissues. However, many cases occur in which the remaining bone and periodontal membrane are inadequate to resist the pressure to which the teeth are subjected. Repair processes are not fully consummated because the forces and stresses interfere with healing. In many such cases, however, repair will occur if the affected teeth are stabilized and immobilized, the pressures reduced, and the various torque strains eliminated. Splints and ligatures can be used successfully for this purpose."

This is a "how-to-do-it" book of real merit.

[1]Beube, Frank E.: Periodontology, New York, The Macmillan Company, 1953, p. 453.

MEDICINE and the Biologic Sciences

Hypertension in Pregnancy

The incidence of infant deaths is four times greater with severely hypertensive mothers than with parturients who do not have hypertension. Among severely hypertensive patients the incidence of eclampsia, premature separation, and prematurity is consistently higher. These factors contribute to infant mortality.

Records indicate that specific hypertension or eclampsia and preeclampsia occur in approximately 3.7 per cent of all deliveries. The infant loss is more than doubled in the deliveries complicated by hypertension. If the blood pressure is only moderately increased the mortality is only slightly greater than average. However, with severe hypertension, the chance of survival is decreased to one-fourth.

Preeclampsia is considered severe when the patients have two or more of the following symptoms: (1) diastolic blood pressures above 110 millimeters of mercury, (2) 2 plus or more proteinuria, (3) extensive generalized edema, (4) hemorrhage or exudates of the eyegrounds, (5) severe hyperflexia, or (6) subjective symptoms of threatening eclampsia.

In mothers who receive no prenatal care, eclampsia occurs twice as frequently as in clinic patients. The infant loss is lower for preeclamptic patients who have adequate attention. The infant mortality is greatly lessened by hospital treatment of the preeclamptic patients.

Hospitalized preeclamptic mothers are treated symptomatically until spontaneous labor supervenes. Pregnancy is terminated in the following situations: (1) if the condition progresses in spite of treatment, (2) if signs and symptoms of threatening eclampsia are noted, or (3) if severe retinopathy appears. Induction is then tried. If this fails, cesarean section is done only if the hypertensive state deteriorates or other obstetric problems arise. The later in gestation the hypertension develops, the lower the infant loss.

In the management of the preeclamptic patients the following factors relating to the fetus are considered: (1) Intrauterine deaths may be sudden. (2) Some infants do not increase in size as expected with time. (3) An inherent normal variation of infant weights exists in different patients at like periods of gestation. (4) Accurate estimation of fetal weight before delivery, especially of a premature infant, is often extremely difficult.

The incidence of eclampsia is much greater in the earlier weeks of gestation, occurring four to five times more frequently up to the thirty-fifth week than from that point to term. The infant mortality increases precipitously when convulsions or coma or both supervene in preeclampsia. The infant loss is greater when the convulsions occur ante partum rather than post partum.

The second stage of labor should be shortened to prevent trauma to the premature infant and progression of the hypertensive state. The incidence of prematurity is three times as high in pregnancies complicated by specific hypertensive disease as in normotensive cases.

Wellen, Irwin: Specific Hypertensive Disease of Pregnancy: Factors Affecting Infant Mortality, Am. J. Obst. & Gynec. **64**:271-280 (*April*) 1952.

Hygiene of the Ear

Many patients have unnecessary ear difficulties because they fail to heed the old aphorism, "Nothing in your ear smaller than your elbow." The principal difficulty is that of impacted cerumen in the ear canal.

The cerumen is packed in the external ear, usually by the patient digging into the canal with his finger in an attempt to scoop out the secretion. As a rule, he pushes the so-called wax further in, beyond the isthmus of the external auditory canal and beyond retrieval.

This condition is commonly found in people who are overly zealous about cleaning their ears. These people should be told that the normal ear canal does not need washing.

The canal skin is extremely sensitive. Cerumen, therefore, should not be removed routinely by digging with "cerumen hooks." Even irrigations can precipitate an external ear infection if done roughly and if the syringe tip is allowed to lacerate the epithelium. If there is any question of external or middle ear infection or tympanic membrane perforation the ear should be washed with alcohol.

The itching ear should be left alone. It is usually caused by a dermatitis of the canal, more often either seborrheic or eczematous. Occasionally when the canal appears normal it may be caused by a nasal or eustachian tube allergy. The pruritus can be controlled best by using 70 per cent alcohol drops in the external ear or by antihistaminics in case of allergy. Scratching with anything, even a cotton-tipped applicator, invites a painful inflammation of the ear canal.

When swimming, the use of ear plugs to prevent external or even middle ear infections is futile. Plugs are inadequate protection against otitis externa and media with tympanic membrane perforation. A person with

a known perforation should absolutely never swim. He should avoid getting water in his ear under any and all circumstances. Ear plugs offer little protectcion against middle ear injury from deep diving, surfboard riding, or underwater spear fishing.

Traumatic perforations of the membrana tympani are painful, shocking and frightening. They should never be treated lightly. The actual medical treatment is to leave them alone, to keep water out, and to give an antibiotic prophylactically.

Barton, Richard T.: Some Fundamentals of Ear, Nose and Throat Hygiene, Postgrad. Med. **12**:451-456 (*November*) 1952.

Acute Cholecystitis—Treatment

Good results in acute inflammation of the gall bladder are obtained with aggressive conservatism. Surgery should be reserved for uncontrolled and spreading abdominal diseases. Each case must be evaluated according to the particular need. Early surgery is to be avoided, insofar as possible.

In most cases, acute symptoms will subside with immediate hospitalization and energetic medical treatment. Usually by the time the surgeon first sees the patient, inflammation, edema, and congestion of the gallbladder, biliary ducts, cystic vessels, and many times, of the liver are far advanced. Such processes, combined with possible vessel and cystic duct anomalies, make for extremely difficult procedures.

In inexperienced hands, surgery for acute cholecystitis is extremely hazardous. The chances of misdiagnosing acute cholecystitis in the first seventy-two hours are high. Time is necessary to make certain of the diagnosis. The patient's general physical condition may be exceedingly difficult to evaluate correctly for some time. The added impact of early surgery can well be fatal to patients who might be carried through successfully by medical treatment.

Immediate hospitalization should be insisted upon. Demerol with atropine and ice is used to relieve pain. In the less severe cases, fluid diet is used. In the severe cases absolute starvation with continued gastric suction is used. Nutrition and electrolyte balance are maintained with parenteral fluids. Infection is controlled with antibiotics. Leukocyte counts are made two to three times daily. A careful record is kept of temperature and respiration.

In most cases symptoms subside rapidly with complete recovery usually occurring within two to ten days from the onset of symptoms. A fat-poor diet is continued at home. An interval cholecystectomy is done six to eight weeks later.

In a small number of patients the symptoms do not subside. Temperature, pulse, and leukocyte counts remain high. Tenderness and spasm persist. Usually these persons can be carried through the emergency with the aid of good hydration and antibiotic therapy.

In spite of all measures a few patients have spreading infection. In these cases, immediate surgery should be done. Cholecystectomy should be performed, if possible.

Treatment of many cases of acute cholecystitis with such a regimen has produced excellent results. None of the patients under 50 years of age died. In the older group a mortality of 2.3 per cent occurred.

Mustard, Russell L., and Custer, Harry R.: The Management of Acute Cholecystitis, Surg., Gynec. & Obst. **95**:59-62 (*July*) 1952.

Rheumatic Fever

The sulfonamide compounds have been successful in the prophylaxis of rheumatic fever. With sulfonamides there is an occasional occurrence of suppression of the activity of the bone marrow. Therefore, because of this and the lack of toxicity of penicillin, the use of penicillin in the prevention of rheumatic fever is gaining favor. This is one circumstance in which the oral use of penicillin is heartily advocated.

There are two aspects to the problem of rheumatic fever. One is the prevention of further attacks in patients who have already experienced one or two episodes. The American Heart Association has outlined an effective schedule for this purpose. This schedule has been generally endorsed by clinicians. It calls for the oral administration of 100,000 to 200,000 units of penicillin three times daily for persons who have had one or more previous attacks of rheumatic fever. For children the administration should be continued through the end of the period of schooling. And for adults it should be continued for at least five years after the last attack of rheumatic fever.

The second phase of the problem is prevention of the initial attack of rheumatic fever. There is increasing evidence to prove that adequate early treatment of streptococcic infection will prevent the initial attack of rheumatic fever in the majority of cases.

Herrell, Wallace E.: Antibiotic and Chemotherapeutic Agents in Infections of the Blood Stream and Heart, JAMA **150**:1450-1455 (December 13) 1952.

WE SEEM to forget: that in the past great discoveries have with few exceptions been made by individual workers, often working in great isolation; that some of the most important discoveries have been made without any plan of research—largely by accident or in dreams, as in the instance of Loewi's Nobel prize-winning discovery; that discoveries have resulted from a general state of what Alan Gregg has called puzzlement—puzzlement at discrepancies in findings—a state of mind which would not lend itself to any accurate verbal description; that there are researchers who do not work on a verbal plane, who cannot put into words what they are doing—whose thinking functions in terms of experiences, subconscious observations—who don't know what they have been after until they actually arrive at their discoveries.

From *Science* **118**:91-92 (July 24) 1953.

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Quote and Unquote

THERE IS a newspaper columnist who has gained a wide reading public by the annoying technique of writing down to people. He sets himself on an Olympian height and pours forth his pronouncement on every known subject. He says that he knows everything. One of his choice methods is to quote liberally from the sages and philosophers and from contemporary books if they are highbrow enough. None of this quoting-unquoting is done with modesty. He has no such inhibitions.

There is nothing wrong or unfair about quoting people who have more wisdom or knowledge than has one himself. It may be an admirable trait and frank admission that somebody else has clearer thoughts and better words of expression. Quoting authority is one of the acceptable methods in scientific writing. Actually many articles are nothing more than a maze of quotes from other people with no original thought expressed. Such writing may be convincing to readers but it does not represent original scholarship in any form.

Now and then, tucked within the millions of words a person reads, he may come upon gems that are worthy of wider display. Often these valuable pieces are found in out-of-the-way places and in publications that have not yet gained the accolade of the Great Books. On occasion it is the terseness or the pungency of the thought expressed; a cutting through to the heart of the subject. Another time it is the sheer richness of the expression. Still another is the highlighting of a universal truth to make it stand out clearly, removed from cloud and fog. Then there is the gem that fits the needs of the moment, that comforts us in sorrow, that gives us hope for despair, that infuses us with courage when fear is close at hand.

Sometimes these jewels of words are found among the sacred writers, but they have no monopoly on the power of expression. Many laical writers have been given the same gift of clarity and beauty of thought and expression.

Most of us are not disposed to associate working scientists with these skills of lofty expression. We are apt to think of scientists as agnostic men dedicated to the humorless search for what they consider to be some truth. Actually, science has no meaning unless it is "done by people for the benefit of people." Science cannot be dehumanized. The scientist who milks the venom from cobras to make it available for research in poliomyelitis has human motivations—to benefit people. The physicist who split the atom did not have in mind the making of a destructive bomb to use to kill people. The A-bomb was a by-product of a more humanistic discovery. So far as I know, no scientist ever deliberately set out to discover or develop something that would destroy people. Exceptions might be

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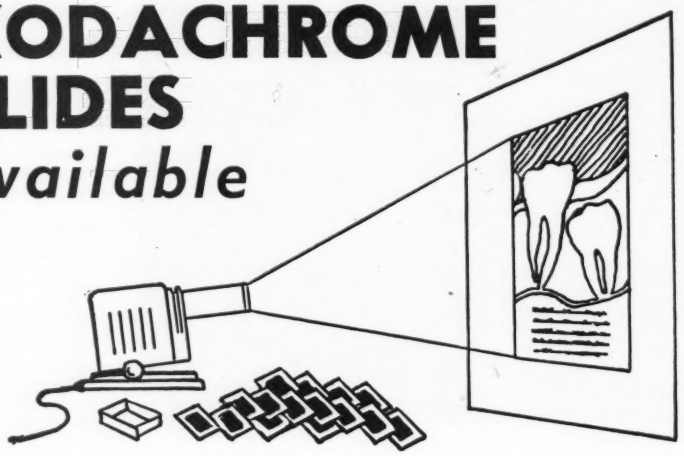

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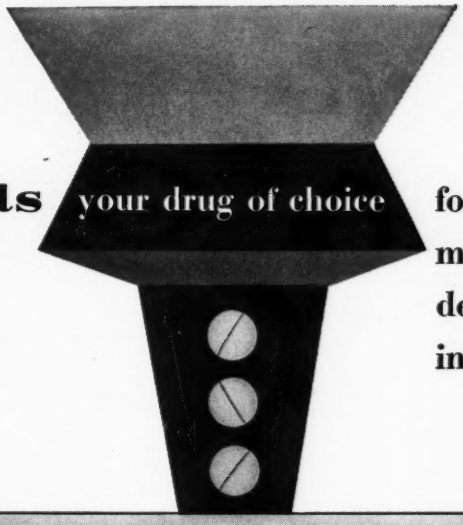

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Staphylococcus	B	A	B	A	B
Pneumococcus	B	A		B	B
C. diphtheriae		A (plus serum)		B	
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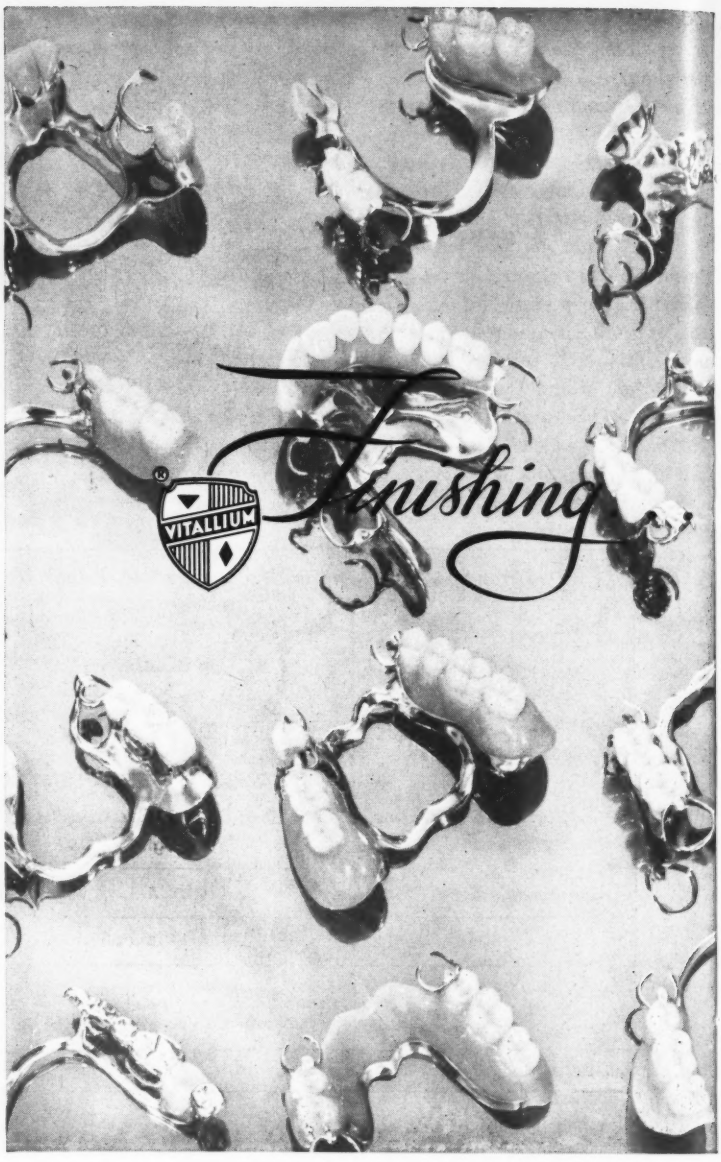
It may be surprising to know that William James was interested in other things than the "facts" of psychology and that C. Judson Herrick was concerned with human values as well as the details of neurology.

William James gave us a test that we may each wish to apply to himself: "The great use of life is to spend it for something that outlasts it." Few of us will ever qualify by doing anything or contributing something that will outlast us. Most of us make no ripple except in the little world in which we stir; within the family group, among our circle of friends, within the small confines of our vocation. But within these limited areas we can "spend our life for something that outlasts it." We do not have to be famous or world-renowned, or known outside our community. Each one of us, no matter how limited his talents and circumscribed his area, has the chance to do something that will outlast his life. It may be nothing more than to give encouragement to the young, or set an example of courage to the fearful. Some people have their names in the newspaper only once—as a paid obituary notice. But that does not mean that many of these people did not give something to the world that outlasted their life.

As another example of quote-unquote from a scientist is this from C. Judson Herrick, the neurologist:

"How do we measure the worth of a man? We commonly use two standards with different and apparently incommensurable scales. One is the worth of a man to himself, the other is his worth to his community. In terms of life as it is lived, the first is measured by what a man gets out of life himself, the second by what he gives away. To make a success of life a workable balance must be struck between these two classes of values. The only real values in the first group are intangibles—the satisfactions achieved. The accumulation of property, of knowledge, of technical skills in business, art, or science, of social graces, fame, and power—these are valuable to a man only in so far as they satisfy his needs and desires. In the second group the values are as diverse as human interests and the appraisal of these values will be made in terms of the appraiser's own personal standards."



Getting something out of life suggests accumulating things and property and living with a full measure of joy. *Giving* something out of life means disassociating oneself from things and possessions and giving the joy to others. Fortunately, the same person can do both. A person may get things to give them away, have fun by giving fun to others.

Contrary to some beliefs, there is nothing evil involved in acquiring possessions provided one remembers that he is the custodian and not the owner. Custodianship implies a responsibility to treat the possession in trust for the time we may hold it. Ownership means that no one else in the world has any rights as far as the particular thing is concerned.

I have always admired the attitude of the American Indian toward property. He believed that land could not be sold, that it was a gift of the Great Spirit. It could be assigned for tribal use but not held by one man or one family for exclusive use. It was on this different concept of property that trouble came between the white man

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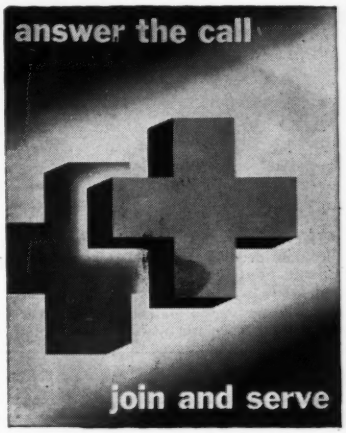

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and the Indian. The tribes and confederacies of Indians thought that they were conveying land for use to white men on a leasehold basis. The white men thought of this transaction as an outright sale. Naturally, misunderstandings came and with them came war. Different sets of values were involved.

The same situation is our dilemma today. The Russians have a different set of values regarding life and property than the values that we hold. The Russians will not accept our set and we will not adopt theirs. Our ethics and culture are totally different from theirs. Neither will give ground to the other. Saying the same thing in scientific terms, let us quote from Matthias Alexander: "Knowledge concerned with sensory experience cannot be conveyed by the written and spoken word so that it means to the recipient what it means to the person who is trying to convey it."

This means that although the Russians are members of the same human family, their sensory experiences have been so confined and inbred that they cannot communicate with us nor we with them. All our sensory experiences lead to thoughts, emotions, feelings, and patterns of action. In scientific terms that means that we are not

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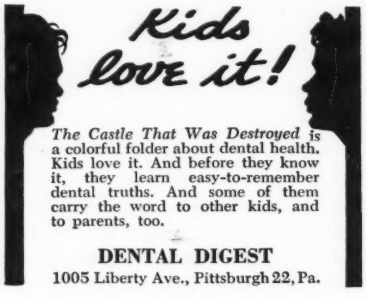

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now, never have been, nor will probably ever be in *rapport* with the Russians. Lack of understanding leads to conflict within the field of the person or a nation.

The quotes and unquotes from scientific sources suggest that scientists are just as concerned with man and his human affairs as are other people.

—E. J. R.

Preanesthetic Evaluation of the Oral Surgical Patient

(*Continued from page* 65)

Complications Associated with the Oral Surgical Condition

(1) Airway maintenance, (2) adequate oxygenation, and (3) prevention of leakage of blood and saliva around the mouth pack are the cardinal principles in a safe procedure. Conditions such as trismus, macroglossia, short mandible, large uvula, large tonsils, infections of the floor of the mouth, and nonpatent nasal passages predispose to respiratory obstruction. When these abnormalities are noted in the preoperative evaluation, intubation should be planned.

Intubation Must be Prompt—If there is any difficulty in maintaining an adequate exchange during surgery, an endotracheal tube should be *skillfully* inserted, as respiratory obstruction and resultant anoxemia should never be allowed to persist. If the intubation is not done *promptly* when attempted, a poor risk case can be transferred into a case for the coroner. Coughing, apnea, and laryngospasm are sequelae of botched intubations.

Method to Inhibit Reflex—A spray of 4 per cent solution of cocaine or transtracheal block prior to insertion of the tube will inhibit the vagovagal reflex. Absent laryngeal reflexes, plus a flow of gases under pressure, enhance the probability of tracheal aspiration of lung abscess-producing material which includes blood, saliva, and debris, as well as tissue, bone, and tooth particles. Nothing should

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CLINICAL AND LABORATORY SUGGESTIONS

(*See pages 76 and 77*)

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Subject: _____

Explanation of Procedure:

Sketch:

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be permitted to escape the surgical field.

Cardiovascular Diseases

All patients with heart disease should not be condemned to local anesthesia for all types of oral surgery. There are relatively simple principles upon which one can depend in evaluating patients. The fundamental principle is based on the question of how much exercise is needed to produce dyspnea and anginal pain. The answer to this question is the exercise tolerance of the patient which is a good index of the functional capacity of the heart.

Evidence of Functional Condition—Cardiac patients who are able to engage in ordinary daily activity without dyspnea, palpitation, midline thoracic pain, and who do not have ankle edema or require more than one pillow to be comfortable at night, are moderately good risks provided certain precautions are taken.

Surety Measures—(1) Hypoxia of any degree should not be allowed to develop, even for a short period of time, (2) a severe fall in blood pressure should be prevented in order to ensure adequate blood flow to myocardium or kidneys which may already be damaged, and (3) large doses of pentothal sodium and prolonged administration are to be avoided in compensated heart disease. Slow pentothal sodium or surital sodium inductions are desired.

Cardiac Arrhythmia—In patients with arrhythmias, chloroform, ethyl chloride, cyclopropane, and trilene are to be avoided. These agents increase the irritability of the autonomic tissues of the heart, and when enhanced by excess endogenous epinephrine, produce disturbances in rhythm, the pacemaker being displaced progressively downward to ventricular fibrillation.

Murmurs—Murmurs are not significant unless they have accompanying clinical myocardial damage. Aortic stenosis or syphilitic aortitis may cause sudden death during anesthesia due to poor coronary artery circulation, especially when attended

by a sudden fall in blood pressure.

Hypertension — Hypertensive patients usually weather a short procedure with an extremely slow pentothal sodium induction quite well. They should be carried on pentothal sodium with nitrous oxide-oxygen to prevent an unphysiologic fall in blood pressure. They are, as a rule more resistant to the general anesthetic agents, which further complicates the picture and makes them generally less than good risks.

Diseases of the Respiratory Tract

A "cold" or upper respiratory infection in the elective surgery patient unequivocably demands postponement of the anesthetic because the onset of all acute respiratory diseases, such as pneumonias, influenzas, pulmonary infarcts simulates a common cold. Patients who have a postnasal drip are prone to have induction coughing or laryngospasm with pentothal sodium.

Substitution of Gas—If the operation cannot be postponed, nitrous oxide-oxygen is preferred as the chief agent. Pentothal sodium should also be avoided in patients with wheezing or paroxysmal cough, in known asthmatic patients, and in hay fever patients (in season), as pentothal sodium is a bronchoconstrictor. Vinethene, ether, and trilene are bronchodilators and may be used with comparative safety.

Reduction in Vital Capacity Increases Risk—Prolonged pentothal sodium anesthesia in patients with lowered vital capacity or tidal volume should be avoided because of respiratory depression. This is also true of barbiturates, morphine, and demerol when used for premedication. Examples of lesions which affect vital capacity are emphysema, lung abscess, bronchiectasis, tuberculosis, pneumonia, pleurisy with effusion, asthma, defects of the thorax, and certain cardiac conditions, particularly mitral stenosis. Reduction in vital capacity makes necessary particular care in the maintenance of adequate ventilation during anesthesia. The most important means of accomplishing this is a free airway.

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Liver and Kidney Diseases

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Diseases of the Central Nervous System

Head injuries, brain tumors, convulsions, fainting spells, and cerebral edema, the latter found in acute and chronic alcoholism, require neurologic consultation, as these conditions may be accompanied by increased intracranial pressure, cerebrovascular resistance, and therefore, decreased cerebral metabolism.

Hazard of Oxygen Deficiency—The damaging effect on the central nervous system whose highly specialized cells do not regenerate is one of the great hazards of oxygen deficiency. The neuron reactions to oxygen deficiency vary with the metabolic rates of the cells, those cells of the most recent phylogenetic origin having the highest metabolic rates and showing the most damage.

Expression of Pathologic Changes—In a generalized way the pathologic changes found in the brain are expressed through (1) postoperative memory losses, (2) psychoses, (3) feeble-mindedness, (4) confusional and comatose states, and (5) personality disorders.

Pentothal Sodium Contraindicated—Like other barbiturates, pentothal sodium exerts a metabolic inhibition which is most marked in the brain. Pentothal sodium as the principal agent, except for induction, therefore, is clearly contraindicated in central nervous system disease.

Metabolic Disease

Diabetes—Diabetic patients should be observed carefully during anesthesia for signs of insulin shock; that is, slow pulse, sweating, and low blood pressure. Suspicious reactions should be treated with a few cubic centi-

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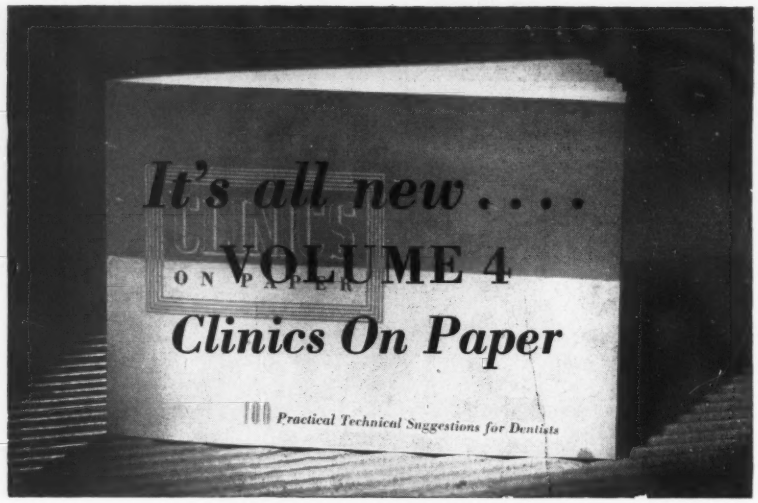

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meters of 50 per cent glucose, administered intravenously. This measure will do no damage in acidosis and may be lifesaving in insulin shock.

Hyperthyroidism—Because of their high metabolic rate, hyperthyroid patients are fairly resistant to anesthetic drugs and require extra premedication and oxygen. The curve of the metabolic rate is parallel to the oxygen demand and the reflex irritability. The factors governing the metabolic rate are the following: (1) Age. The older the person, the lower the rate. (2) Weight. The high rate of the muscular person as compared to that of the thin asthenic person. (3) Emotional state. Fear and apprehension cause a temporary preanesthetic increase in metabolic activity. (4) Pain. The irritability of the nervous system is increased by pain, (5) Fever. For each degree of fever there is about 7½ per cent increase in metabolic rate.

Hypothyroidism—As they are highly susceptible to sedative drugs and powerful anesthetic agents, hypothyroid patients are easily carried to respiratory arrest with powerful or quick-acting agents such as chloroform, ethyl chloride, or pentothal sodium. These patients also have premature aging of the coronary arteries.

Addison's Disease — This disease should be suspected in the presence of lassitude, hypotension, and brown pigmentation of the gums or skin, or both. These patients are prone to die within a few days after even minor surgery if the case has been undiagnosed; they deserve the best local anesthetic. Nitrous oxide-oxygen may be used but opiates, barbiturates, and vapors should be avoided.

Drug Addiction—Opiates, barbiturates, and alcohol are all sedative drugs, and drug addictive patients exhibit cross-tolerance to the anesthetic depressant drugs.

Summary

Proper evaluation of the candidate for oral surgery requires a sound background in the basic sciences, experience in the hazards of anesthesia, a thorough knowledge of anesthetic methods, agents, and techniques, and an undeviating attitude based on predetermined opinions formed in the intense apprehension of near calamity.

Prevention of death is not enough. Often postoperative sequelae of a serious nature follow neglect of the cardinal principles of a safe procedure: airway maintenance, adequate oxygenation, and prevention of leakage of fluids around the mouth pack.

The moral and ethical duty of the anesthetist is to ensure minimal disturbance to the normal physiology, neither initiating nor contributing to disease processes. For this reason, the proper evaluation of the physical state, the correct agent, and anesthetic method suitable for the patient must be ascertained by obtaining a complete history and consulting with other specialists, if necessary.

Adapted from *Oral Surgery, Oral Medicine and Oral Pathology* **5**:728-733 (July) 1952.

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Dental Observations on Australian Aborigines

M. J. BARRETT
Melbourne, Australia

Occlusion

A characteristic feature of the primitive aboriginal dentition is the acquisition of an edge-to-edge relationship of the anterior teeth following reduction of cusp height by occlusal attrition and the greater freedom of mandibular movement which results. As appreciable occlusal wear has taken place by the late teens under primitive conditions, it may be assumed that by this time the change in anterior tooth relationship from the overbite condition of the adolescent to the edge-to-edge bite of the adult is well advanced.

Adolescent Condition Persists

In the Yuendumu natives the adolescent condition persists in many persons well into adulthood. Less than one-third of the young adults, and only half of the mature adults, show an edge-to-edge occlusion of their anterior teeth, but in many of these subjects, appreciable incisal wear has occurred and the anterior teeth are opposed in function. In a number of instances an edge-to-edge occlusion recorded in the field proved to be a functional positional relationship and not the position of centric occlusion when the corresponding casts were examined subsequently.

Unusual Features Noted—In a number of young aborigines an unusual feature of occlusal relationships was noted. A definite position of so-called centric occlusion cannot be established readily; but the jaws or models can be positioned on either the right or the left-hand side in an eccentric position giving an apposition of the molars and premolars in which the cuspal relationships of the observed side are precisely those usually described as in centric occlusion. When one side is thus occlusally interdigitated the corresponding teeth on the opposite side of the arches show an obvious, in some cases marked, buccolingual overlap.

Functional Operation—In functional operation the establishment of the final position of interlocked cuspal occlusion is not simultaneously bilateral but is alternately a unilateral condition of occlusion.

Crowding and Malposition—In the teeth of Australian aborigines crowding malposition is not uncommon. One authority has shown that twenty per cent of the skulls he examined (material dating from pre-white occupation) showed some degree of tooth irregularity. Examination of the series of casts obtained at Yuendumu revealed thirty-six per cent with Class 1 malocclusion. There is, throughout the series, evidence of bimaxillary protrusion greater than that seen in skulls of pre-white Australian aborigines in the South Australian Museum. This condition is present even among the persons showing no evidence of tooth crowding.

(*Continued on page* 96)

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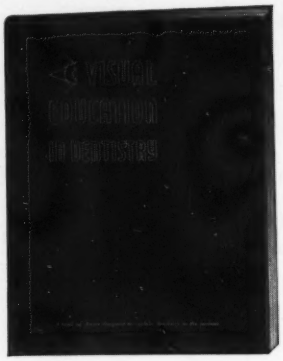

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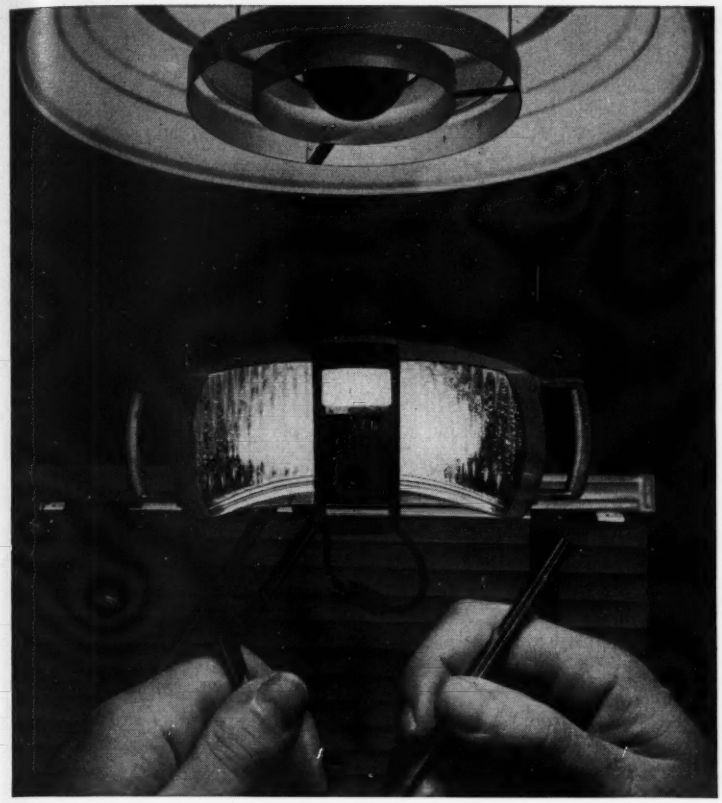

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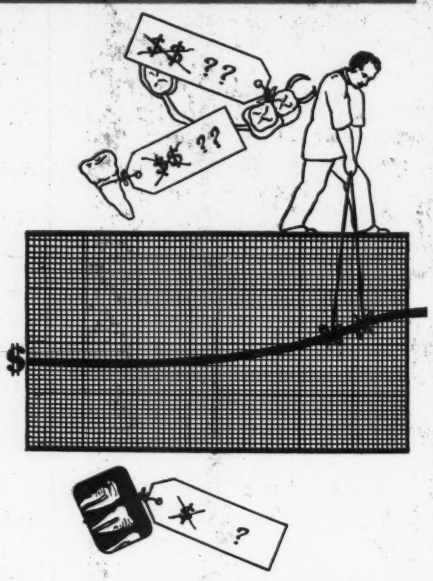

RAISING FEES

Do you feel that your fees are lower than they should be? That they haven't kept pace with the rising cost of living?

Many dentists face this same problem; some have already worked out a satisfactory solution. A summary of the experiences of dentists in different parts of the country is presented in the article, "Raising Fees."

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"We Have Come a Long Way," remarks Doctor Neill W. Macaulay in relating the story of South Carolina's "Dean of Dentistry," Doctor Euston Nathalie Kibler.

Doctor Kibler, now in his eighties, looks back on a professional life that was highly successful, and a public life rich in satisfaction. For twenty years, he served in the Legislature of South Carolina, and, in fact, is the author of the dental laws which are in effect in that state today.

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When mothers discuss their baby's first teeth, do you know how to help and advise them? Doctor Cyril B. Kanterman supplies much of the information a mother may need "When Baby Is Teething."

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"The Dentist Grant Wood Made Famous" was a rather unwilling model. Doctor Byron H. McKeeby consented to pose for his friend only when assured that the picture would not look like him. When the painting was exhibited and won national acclaim, the model could no longer remain anonymous.

When you're itemizing business assets, do you include, "one intelligent wife"? Such an entry might look odd on the books, but would not be incorrect in a financial sense, according to the author of "How To Be a Dentist's Wife."

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"Do Your Patients Know YOU?" Because good public relations is the basis of any successful practice, perhaps it would be wise to give the article—and the question—serious consideration.

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Are you a fisherman? Even though you haven't dipped a line since the days of childhood, you'll enjoy the story of Doctor J. C. Overbey's battle with a marlin, 570 pounds of determined, active resistance.

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Are you one of the many dentists who disagree with the House of Delegates' vote on Social Security? A three-state poll shows that the majority of dentists in Massachusetts, Minnesota, and Oregon *do* want to be covered by OASI (Old-Age Survivors Insurance). Doctor Earl H. McGonagle suggests that there's only one way to make sure Congress will consider the wishes of the majority of dentists as well as the viewpoint of the House of Delegates, and that is, "If You Want Social Security, Tell Your Congressman."

★ ★ ★

"Conversation: The Lost Art"—may be a real asset in building a successful dental practice.

(*Continued from page 93*)

Possible Basis for Difference—Differences in occlusion and in tooth to basal bone relationship may be due to the relatively small amount of interproximal attrition in the Yuendumu natives compared with the marked attrition seen in the pre-white aborigines and may be the direct result of the present diet of the natives.

Summary

The incidence of dental diseases is low compared with that in white communities, but possibly higher than with typical nomadic native groups. The introduction of civilized food habits is considered a factor in the deterioration of native dental conditions becoming apparent in this community.

Adapted from *Australian Journal of Dentistry* **57**:136-137 (June) 1953.

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